ARCHIVES OF OTOLARYNGOLOGY

VOLUME 1 MAY, 1925 NUMBER 5

BLOOD CALCIUM IN UNDIFFERENTIATED DEAFNESS

A PRELIMINARY REPORT *

SAMUEL J. KOPETZKY, M.D.
AND
RALPH ALMOUR, M.D.
NEW YORK

The clinical differentiation of cases in which a reduction of the hearing has occurred is at best only an approximation. We endeavor to classify cases into three main groups: middle ear catarrh, acoustic nerve deafnesss and otosclerosis. For our classification, we utilize signs and quantitative reactions to the tuning forks, which are for the most part inaccurate in that they are directly dependent on the judgment, intelligence and cooperation of the patient. The examiner has no means by which he personally can quantitatively estimate the amount of hearing present in any given case. We should, therefore, realize that what we consider an exact quantitative estimation is in reality only a qualitative one. The fact that a patient states that he hears a certain sound for a certain length of time should be considered only as an indication that hearing for that tone in the given amplitude is either reduced or increased. Then again, the element of the patient's intelligence will often alter the results of the tests to such an extent that what is really a deafness of one type will be made to appear that of another type.

The study contained in this paper, which is merely a preliminary report of work in progress, was prompted by the conflicting evidence presented in an attempt to analyze the great majority of cases of deafness seen in the course of routine practice. Many patients who presented all the clinical evidence of a middle ear catarrh reacted to the tuning forks in a manner generally characteristic of otosclerosis. On the other hand, patients presenting all the clinical stigmas of otosclerosis showed, in the functional tests of the hearing, findings which were significant of a true nerve deafness. Assuming, as a basis for our study, that certain generalized diseases, as well as metabolic disturbances, are capable of causing a reduction in hearing, a study of the blood chemistry was undertaken in a consecutive series of cases of deafness coming under our observation, with the idea of determining what chem-

* From the Otolaryngological Department of Beth Israel Hospital.

ical changes in the blood were associated with the loss of acoustic function. Conversely, there seemed a possibility that we might be able to correlate certain clinical types of deafness with definite changes in the blood chemistry and so enable ourselves to determine accurately the cause of the interference with hearing.

PROCEDURE

The cases to be reported are recorded in the order in which they were examined. The functional tests of the hearing were made with the Lucae hammer forks. In all cases, the blood for examination was obtained at least twelve hours after the patient had last eaten. This precaution was deemed necessary because of the alterations in the quantitative chemical composition of the blood as a result of the digestion of food and the absorption of digested products into the blood stream. In those cases in which any evidence of acoustic nerve involvement existed, the Wassermann reaction was determined.

CASE REPORTS

CASE 1.—S. E., a woman, aged 24, unmarried, had noticed a loss in hearing for the last six years. This apparently followed an attack of pneumonia. She also complained of an intense tinnitus in both ears which was made worse by a "head cold." She has one sister who also is hard of hearing.

Otoscopic examination showed a slight retraction of both drums. There were no evident pathologic changes in the nose or throat.

TABLE 1.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	21	14	45
Middle C, bone	19	20	20
C^4, air	27	27	35
C 64 D. V.	Heard	Heard	Heard
Weber test: No lateralization.			

The clinical diagnosis was deafness due to middle ear catarrh.

TABLE 2.—*Chemical Examination of Blood in Case 1*

Test	Mg. per 100 C.c.	Normal
Sugar	120.0	60–120
Urea nitrogen	12.5	12– 15
Nonprotein nitrogen	30.0	25– 30
Uric acid	3.1	1– 3
Calcium	5.5	8– 10
Phosphorus	4.3	2– 6

Comment: The calcium content was diminished; the uric acid content increased.

CASE 2.—R. E., a woman, aged 21, unmarried, had been hard of hearing for one year. She had a slight tinnitus in both ears. The patient was subject to frequent attacks of tonsillitis which seemed to impair the hearing further. Her mother and her mother's uncle were hard of hearing.

Otoscopic examination revealed a moderate retraction of both drums. The nose and pharynx were normal. The faucial tonsils were infected and enlarged.

TABLE 3.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	20	33	45
Middle C, bone	21	30	20
C^4, air	26	30	35
C 64 D. V.	Heard faintly	Heard faintly	Heard

Weber test: No lateralization.

The clinical diagnosis was otosclerosis.

TABLE 4.—*Chemical Examination of Blood in Case 2*

Test	Mg. per 100 C.c.	Normal
Sugar	82.0	60–120
Urea nitrogen	16.8	12– 15
Nonprotein nitrogen	29.6	25– 30
Calcium	7.2	8– 10
Phophorus	3.0	2– 6

Comment: The calcium content was diminished; the urea nitrogen increased.

CASE 3.—P. E., a woman, aged 48, married, had a progressive loss of hearing in both ears for the last twenty years. Tinnitus was present constantly. There was no history of deafness in the family. There was no evidence of syphilis. During the last eight years, she had pain in both ears. She did not know what caused the deafness.

Otoscopic examination revealed a marked retraction of both drums, more marked on the left side. There was an infection of the left faucial tonsil and a hypertrophy of the lingual tonsil.

TABLE 5.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	10	0	45
Middle C, bone	30	36	20
C^4, air	14	10	35
C 64 D. V.	Not heard	Not heard	Heard

With the Barany noise apparatus in the right ear, the patient heard shouted voice in the left ear.

Weber test: No lateralization.

The clinical diagnosis was otosclerosis.

TABLE 6.—*Chemical Examination of Blood in Case 3*

Test	Mg. per 100 C.c.	Normal
Sugar	112.0	60–120
Urea nitrogen	14.8	12– 15
Uric acid	3.2	1– 3
Calcium	9.0	8– 10
Phosphorus	2.8	2– 6
Magnesium	2.4	2– 3

Comment: The uric acid was increased.

CASE 4.—T. E., a woman, aged 31, married. For the last year, following pregnancy, she was hard of hearing in both ears, but more so in the right. This started with tinnitus and was followed by a gradual loss of hearing. She had two brothers who were hard of hearing.

Otoscopic examination showed only a slight retraction of the right drum. There was no evidence of pathologic changes in the nose or throat.

TABLE 7.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	14	40	45
Middle C, bone	21	23	20
C^4, air	24	31	35
C 64 D. V.	Not heard	Heard	Heard

Weber test: Lateralized to left ear.

The clinical diagnosis was otosclerosis.

TABLE 8.—*Chemical Examination of Blood in Case 4*

Test	Mg. per 100 C.c.	Normal
Sugar	86.0	60–120
Urea nitrogen	12.0	12– 15
Uric acid	1.5	1– 3
Calcium	5.5	8– 10
Phosphorus	2.1	2– 6

Comment: The calcium content was diminished.

CASE 5.—P. S., a man, aged 32, married, had been deaf since the age of 14 years. He had typhoid fever two years prior to the onset of the deafness. His mother had had progressive deafness for many years.

Otoscopically, a marked retraction of both drums was present.

Functional examination of the hearing was unreliable, as the patient gave normal responses for air conduction while being unable to hear well even with the aid of an acousticon. His bone conduction, however, was markedly prolonged.

The clinical diagnosis was otosclerosis.

TABLE 9.—*Chemical Examination of Blood in Case 5*

Test	Mg. per 100 C.c.	Normal
Sugar	114.0	60–120
Urea nitrogen	14.5	12– 15
Uric acid	3.2	1– 3
Calcium	7.2	8– 10
Phosphorus	2.0	2– 6

Comment: The calcium content was diminished; the uric acid content increased.

CASE 6.—S. W., a woman, unmarried, aged 20. During last four years, she noticed that her hearing was becoming poor, more so in the right than in the left ear. This condition had been growing worse during the past month. Her mother was hard of hearing.

Otoscopic examination showed but a slight retraction of both drums. The nose and throat were normal.

TABLE 10.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	15	21	45
Middle C, bone	23	26	20
C^4, air	25	31	35
C 64 D. V.	Not heard	Heard faintly	Heard

Weber test: Lateralized to the right ear.

The clinical diagnosis was middle ear catarrh with beginning otosclerosis.

TABLE 11.—*Chemical Examination of the Blood in Case 6*

Test	Mg. per 100 C.c.	Normal
Uric acid	1.3	1– 3
Calcium	11.0	8– 10
Phosphorus	2.0	2– 6

Comment: The calcium content was increased.

CASE 7.—G. E., a woman, aged 44, married, had been suffering from head noises and a gradual loss of hearing in both ears for the last eighteen years. The tinnitus recently became unbearable. She had one uncle who was hard of hearing. She had had five pregnancies which she thought aggravated the condition.

Otoscopic examination showed a retraction of both drums. The nose and throat were normal.

TABLE 12.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	15	6	45
Middle C, bone	17	13	20
C^4, air	19	8	35
C 64 D. V.	Heard faintly	Not heard	Heard
Weber test: No lateralization.			

The clinical diagnosis was acoustic nerve deafness.

TABLE 13.—*Chemical Examination of Blood in Case 7*

Test	Mg. per 100 C.c.	Normal
Sugar	82.0	60–120
Urea nitrogen	16.8	12– 15
Nonprotein nitrogen	29.6	25– 30
Calcium	7.2	8– 10
Phosphorus	3.0	2– 6

Comment: The calcium content was diminished; the urea nitrogen content increased.

CASE 8.—C. B. H., a man, aged 67, married. For the last twenty-nine years the patient had noticed a reduction in hearing in both ears and tinnitus on the left side. He knew of no possible cause for the condition. Occasionally, there seemed to be an aggravation of the condition during damp weather.

Otoscopic examination showed thickened and retracted drums. No pathologic changes were seen in the nose or throat.

TABLE 14.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	18	20	45
Middle C, bone	19	21	20
C^4, air	22	22	35
C 64 D. V.	Heard	Heard	Heard
Weber test: No lateralization.			

The clinical diagnosis was chronic catarrhal otitis media.

TABLE 15.—*Chemical Examination of Blood in Case 8*

Test	Mg. per 100 C.c.	Normal
Sugar	80.0	60–120
Urea nitrogen	12.0	12– 15
Uric acid	3.3	1– 3
Calcium	9.0	8– 10
Phosphorus	3.1	2– 6

Comment: The uric acid content was increased.

CASE 9.—E. R., a woman, aged 23, unmarried, complained of a stuffy feeling in both ears for the last two years. She was also troubled with difficulty in nasal respiration and had some disturbance in taste. She had a profuse nasal discharge, which was most marked on arising in the morning. Her mother and sister were hard of hearing, following middle ear suppuration, according to the patient's story.

Otoscopic examination revealed a slight retraction of both drums. There was an atrophic rhinitis present, due to chronic bilateral suppurative ethmoiditis.

TABLE 16.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	24	26	45
Middle C, bone	19	20	20
C^4, air	26	30	35
C 64 D. V.	Heard	Heard	Heard
Weber test: No lateralization.			

The clinical diagnosis was middle ear catarrh.

TABLE 17.—*Chemical Examination of the Blood in Case 9*

Test	Mg. per 100 C.c.	Normal
Sugar	76.0	60–120
Urea nitrogen	11.4	12– 15
Uric acid	1.5	1– 3
Calcium	6.8	8– 10
Phosphorus	4.1	2– 6

Comment: The calcium and the urea nitrogen content were diminished.

CASE 10.—S. M., a man, aged 30, unmarried. The patient noticed an impairment of hearing in the right ear for many years. Six years ago, following an attack of Bell's palsy on the right side, he noticed that the hearing in the right ear became worse.

There was no history of venereal disease. He had one brother who was hard of hearing.

Otoscopic examination showed a moderate retraction of both drums. The nose and throat were normal.

TABLE 18.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	17	48	45
Middle C, bone	16	17	20
C^4, air	17	25	35
C 64 D. V.	Heard faintly	Heard	Heard
Weber test: Lateralized to right ear.			
Wassermann test was negative.			

The clinical diagnosis was acoustic nerve deafness.

TABLE 19.—*Chemical Examination of the Blood in Case 10*

Test	Mg. per 100 C.c.	Normal
Sugar	90.0	60–120
Urea nitrogen	16.2	12– 15
Uric acid	2.0	1– 3
Calcium	7.0	8– 10
Phosphorus	5.1	2– 6
Magnesium	2.8	2– 3

Comment: The calcium content was diminished; the urea nitrogen content increased.

CASE 11.—T. S., a woman, aged 48, married. For the last fifteen years she had been complaining of poor hearing, more marked in the left than in the right ear. There had been a tinnitus in the left ear for the last four years. There had never been any aural discharge. One son and one daughter were hard of hearing. The causative factor in her case, as well as in her children's, was unknown.

Otoscopic examination showed retracted and lusterless drums. The nose and throat showed a hypertrophic condition of the mucous membrane.

TABLE 20.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	14	5	45
Middle C, bone	16	16	20
C^4, air	29	22	35
C 64 D. V.	Heard	Not heard	Heard

Weber test: Lateralized to the left ear.

The clinical diagnosis was middle ear catarrh with secondary acoustic nerve deafness.

TABLE 21.—*Chemical Examination of the Blood in Case 11*

Test	Mg. per 100 C.c.	Normal
Sugar	116.0	60–120
Uric acid	2.0	1– 3
Urea nitrogen	13.1	12– 15
Calcium	8.0	8– 10
Phosphorus	3.2	2– 6
Magnesium	2.7	2– 3

Comment: The calcium content was at lowest limit.

CASE 12.—E. K., a woman, aged 27, married. After childbirth three years previously, the patient noticed a gradual loss in hearing in both ears, more so in the right. There was only occasional tinnitus. Her paternal grandfather was deaf. There was no history of venereal disease. For eight months prior to our examination, the patient had taken roentgen-ray treatments for the improvement of her hearing. This gave her relief for only a short time following each treatment. The patient thought that she was getting worse.

Otoscopic examination showed both drums in practically normal position. The nose and throat were normal.

TABLE 22.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	15	15	45
Middle C, bone	24	31	20
C^4, air	24	23	35
C 64 D. V.	Not heard	Not heard	Heard

Weber test: Lateralized to left ear.
Wassermann test was negative.

The clinical diagnosis was otosclerosis.

TABLE 23.—*Chemical Examination of the Blood in Case 12*

Test	Mg. per 100 C.c.	Normal
Sugar	116.0	60–120
Urea nitrogen	16.2	12– 15
Uric acid	2.4	1– 3
Calcium	6.9	8– 10
Phosphorus	3.0	2– 6
Cholesterol	175.0	140–180

Comment: The calcium content was diminished; the urea nitrogen content increased.

CASE 13.—E. J., a woman, aged 35, married, complained of a loss of hearing in both ears for several years. During the last two months there had been a constant tinnitus in both ears. She had a severe headache over the occiput and over the left eye. No other member of the family was hard of hearing. The patient had two children.

Otoscopic examination showed both drums to be normal. The nose and throat were normal.

TABLE 24.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	20	17	45
Middle C, bone	19	23	20
C^4, air	26	20	35
C 64 D. V.	Not heard	Not heard	Heard

Weber test: Lateralized to the left.
Functional examination six months later showed an increase in the bone conduction for both ears, 24/20 of normal in the right and 30/20 of normal in the left.
Wassermann test was negative.

The clinical diagnosis was otosclerosis.

TABLE 25.—*Chemical Examination of the Blood in Case 13*

Test	Mg. per 100 C.c.	Normal
Sugar	136.0	60–120
Urea nitrogen	11.9	12– 15
Uric acid	4.3	1– 3
Calcium	6.9	8– 10
Phosphorus	4.5	2– 6

Comment: The calcium content was diminished; the sugar and the uric acid content were increased.

CASE 14.—E. R., a woman, aged 33, married, had been troubled with a progressive loss in hearing for the last ten years. This followed pregnancy, and became worse each time after two subsequent pregnancies, six and two years ago, respectively. Severe tinnitus was present. No other member of her family had a similar impairment.

Otoscopic examination showed both drums to be retracted. The nose and throat were normal.

TABLE 26.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	13	10	45
Middle C, bone	20	23	20
C^4, air	30	23	35
C 64 D. V.	Not heard	Not heard	Heard

Weber test: No lateralization.
Wassermann test was negative.

The clinical diagnosis was otosclerosis.

TABLE 27.—*Chemical Examination of the Blood in Case 14*

Test	Mg. per 100 C.c.	Normal
Sugar	102.0	60–120
Urea nitrogen	10.0	12– 15
Uric acid	1.7	1– 3
Calcium	7.6	8– 10
Phosphorus	4.1	2– 6

Comment: The calcium and the urea nitrogen content were diminished.

CASE 15.—E. B., a woman, aged 19, married, had had a progressive loss of hearing in the right ear for the last four years. There also seemed to be some loss of hearing in the left ear which she had only recently noticed. There was occasional tinnitus. Her father, her paternal aunt and one of the latter's children were hard of hearing.

Otoscopic examination showed both drums to be normal in position and color. The nose and throat were normal.

TABLE 28.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	20	32	45
Middle C, bone	36	45	20
C^4, air	30	31	35
C 64 D. V.	Not heard	Heard	Heard

Weber test: Lateralized to right.

The clinical diagnosis was otosclerosis.

TABLE 29.—*Chemical Examination of the Blood in Case 15*

Test	Mg. per 100 C.c.	Normal
Sugar	104.0	60–120
Urea nitrogen	13.0	12– 15
Uric acid	1.8	1– 3
Calcium	6.6	8– 10
Phosphorus	2.9	2– 6

Comment: The calcium content was diminished.

CASE 16.—F. W. R., a man, aged 52, unmarried. For the last thirty years, the patient had had a progressive loss of hearing in both ears. This loss was gradual and not noticeable until about a month prior to examination, when the hearing suddenly became very poor in both ears. The patient's mother and paternal grandfather were deaf. The patient had contracted syphilis thirty-five years previously, and had been treated at varying intervals up to five years prior to examination.

Otoscopic examination showed markedly retracted drums. The nose and throat were the seat of a chronic hypertrophic condition.

TABLE 30.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	11	10	45
Middle C, bone	12	10	20
C^4, high	19	18	35
C 64 D. V.	Not heard	Heard	Heard

Weber test: Lateralized to right.
Wassermann reaction, 2 plus.

The clinical diagnosis was acoustic nerve deafness, syphilitic.

TABLE 31.—*Chemical Examination of the Blood in Case 16*

Test	Mg. per 100 C.c.	Normal
Sugar	102.0	60–120
Urea nitrogen	13.2	12– 15
Uric acid	1.6	1– 3
Calcium	9.0	8– 10
Phosphorus	4.3	2– 6

Comment: The findings came within the normal range.

CASE 17.—D. M. G., a woman, aged 31, married, had noticed a progressive loss in hearing during the last ten years. This began after her first pregnancy and became noticeably worse after two subsequent pregnancies. She also complained of intense tinnitus in both ears. There was no history of deafness in her family.

Otoscopic examination showed a moderate retraction of both drums. The nasal septum was deflected to the right. The faucial tonsils were infected.

TABLE 32.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	19	12	45
Middle C, bone	20	20	20
C^4, air	20	20	35
C 64 D. V.	Not heard	Not heard	Heard
Weber test: No lateralization.			

The clinical diagnosis was otosclerosis.

TABLE 33.—*Chemical Examination of the Blood in Case 17*

Test	Mg. per 100 C.c.	Normal
Sugar	98.0	60–120
Urea nitrogen	13.2	12– 15
Uric acid	1.5	1– 3
Calcium	5.6	8– 10
Phosphorus	3.2	2– 6

Comment: The calcium content was diminished.

CASE 18.—L. H., a woman, aged 63, married, complained of loss of hearing for many years. Following an attack of grip three months prior to examination, she noticed that her hearing was getting worse. Her maternal grandmother, her mother, her maternal aunt and uncle were hard of hearing. She suffered from intense tinnitus.

Otoscopic examination showed the presence of a chronic catarrhal otitis media. The nose and throat were normal.

TABLE 34.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	30	25	45
Middle C, bone	18	20	20
C^4, air	31	27	35
C 64 D. V.	Heard	Heard	Heard
Weber test: Lateralized to the left ear.			

The clinical diagnosis was otosclerosis.

TABLE 35.—*Chemical Examination of the Blood in Case 18*

Test	Mg. per 100 C.c.	Normal
Sugar	120.0	60–120
Urea nitrogen	13.6	12– 15
Uric acid	4.0	1– 3
Calcium	6.0	8– 10
Phosphorus	5.0	2– 6

Comment: The calcium content was diminished; the uric acid content increased.

CASE 19.—N. F., a man, aged 35, married, complained of some loss of hearing in the right ear. This followed a pansinusitis two years previously. There was no tinnitus. There had never been any aural discharge.

Otoscopic examination showed both drums to be slightly retracted. The septum was deflected to the left. The faucial tonsils were infected.

TABLE 36.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	35	35	45
Middle C, bone	20	30	20
C^4, air	25	29	35
C 64 D. V.	Not heard	Heard	Heard

Weber test: Lateralized to the left ear.

The clinical diagnosis was early otosclerosis.

TABLE 37.—*Chemical Examination of the Blood in Case 19*

Test	Mg. per 100 C.c.	Normal
Sugar	108.0	60–120
Urea nitrogen	15.5	12– 15
Uric acid	4.1	1– 3
Phosphorus	3.2	2– 6
Calcium	6.4	8– 10

Comment: The calcium content was diminished; the uric acid and the urea nitrogen content were increased.

CASE 20.—H. S., a woman, aged 40, noticed a slight disturbance in hearing for the last six months. She had some cerumen removed from both ears about six months prior to examination, and attributed her loss in hearing to trauma sustained at that time. She was the daughter of L. H. (Case 18) and apparently considered that the deafness ran in the family. The hearing became worse at the menstrual period.

Otoscopic examination revealed a marked retraction of both drums. The nose and throat were normal.

TABLE 38.—*Functional Examination of the Hearing*

	Right Ear	Left Ear	Normal
Middle C, air	30	35	45
Middle C, bone	13	11	20
C^4, air	26	20	35
C 64 D. V.	Heard	Heard	Heard

Weber test: No lateralization.

The clinical diagnosis was acoustic nerve deafness.

TABLE 39.—*Chemical Examination of the Blood in Case 20*

Test	Mg. per 100 C.c.	Normal
Sugar	94.0	60–120
Urea nitrogen	12.0	12– 15
Uric acid	1.3	1– 3
Calcium	9.4	8– 10
Phosphorus	2.8	2– 6

Comment: The findings were normal.

ANALYSIS OF FINDINGS

Of the twenty patients examined, fourteen showed a diminution in the calcium content of the blood. In ten, a clinical diagnosis of otosclerosis had been made. The clinical diagnosis was based on the following factors: (1) heredity, (2) the influence of pregnancy and infectious diseases, (3) prolonged bone conduction and (4) raising of the lower tone limit.

TABLE 40.—*The Fourteen Cases in Which the Calcium Content Was Found Diminished*

Case	Diagnosis	Heredity	Prolonged Bone Conduction	Effect of Pregnancy or Infectious Disease	Raising of Lower Tone Limit	Calcium Content
1	Chronic catarrhal otitis media..	Yes	No	Followed pneumonia	No	Low
2	Otosclerosis.....	Yes	Yes	Worse after an attack of tonsillitis	No	Low
4	Otosclerosis.....	Yes	Yes	Followed pregnancy	Yes	Low
5	Otosclerosis.....	Yes	Yes	Followed typhoid	Yes	Low
7	Nerve deafness.....	Yes	No	Made worse by pregnancies	Yes	Low
9	Chronic catarrhal otitis media..	Yes	No	None	No	Low
10	Nerve deafness.....	Yes	No	Became worse after Bell's palsy	No	Low
12	Otosclerosis.....	Yes	Yes	Followed pregnancy	Yes	Low
13	Otosclerosis.....	No	Slight	None	Yes	Low
14	Otosclerosis.....	No	Slight	Followed pregnancy	Yes	Low
15	Otosclerosis.....	Yes	Yes	None	Yes	Low
17	Otosclerosis.....	No	No	Followed pregnancy	Yes	Low
18	Otosclerosis.....	Yes	No	None	No	Low
19	Otosclerosis.....	No	Yes	Following sinusitis	Yes	Low

TABLE 41.—*Chart of the Remaining Six Cases*

Case	Diagnosis	Heredity	Prolonged Bone Conduction	Effect of Pregnancy or Infectious Disease	Raising of Lower Tone Limit	Calcium Content
3	Otosclerosis.....	No	Yes	None	Yes	Normal
6	Chronic catarrhal otitis media; otosclerosis.....	Yes	Yes	None	Yes	Increased
8	Chronic catarrhal otitis media...	No	No	None	No	Normal
11	Chronic catarrhal otitis media...	Yes	No	None	Yes	Lowest normal
16	Nerve deafness.....	Yes	No	Syphilis	Yes	Normal
20	Nerve deafness.....	Yes	No	None	No	Normal

Since the greatest number of patients in which the calcium content was decreased coincided with those which had been clinically considered as otosclerosis, the following tables were compiled, so that the factors necessary to a diagnosis of otosclerosis could be compared with the calcium findings in each of the patients. Table 40 represents the fourteen cases in which the calcium content was found diminished. Table 41 includes the remaining six cases.

Table 42 shows that the alteration of the calcium content of the blood was associated with a history of heredity, and a raising of the lower tone limit more often than with the prolongation of bone conduction or the influence of infectious disease and pregnancy on the hearing. It further shows that in eleven of the twelve patients whose condition was diagnosed as otosclerosis, the calcium content of the blood was altered from the normal.

TABLE 42.—*Summary of Relation Between Clinical Factors and Calcium Findings in Blood*

Clinical Factors	Calcium Diminished	Calcium Plus	Calcium Normal
Heredity	10	1	3
Prolonged bone conduction	6	1	1
Influence of pregnancy	5	0	0
Influence of infectious disease	5	0	1
Raising of lower tone limit	9	1	3
Clinical diagnosis:			
Otosclerosis	10	1	1
Middle ear catarrh	2	0	2
Acoustic nerve deafness	2	0	2

TABLE 43.—*Summary of Relation Between Clinical Factors and Calcium Findings in Blood*

Case	Diagnosis	Clinical Factors Which Might Lead to a Diagnosis of Otosclerosis: Their Presence or Absence	Calcium Determination
1	Chronic catarrhal otitis media	Present: Heredity, pneumonia at onset. Absent: Results of fork tests	Decreased
7	Nerve deafness	Present: Heredity, pregnancy at onset, raising of lower tone limit. Absent: Prolonged bone conduction	Decreased
10	Nerve deafness	Present: Heredity, aggravation of condition by Bell's palsy. Absent: Results of fork tests	Decreased
9	Chronic catarrhal otitis media	Present: Heredity. Absent: All other factors	Decreased
8	Chronic catarrhal otitis media	All factors absent	Normal
11	Chronic catarrhal otitis media	Present: Heredity, raising of lower tone limit. Absent: All other factors	Lowest normal limit
16	Nerve deafness	Present: Heredity; patient has active syphilis. Absent: All other factors	Normal
20	Nerve deafness	Present: Heredity. Absent: All other factors	Normal
3	Otosclerosis	Present: Results of fork tests. Absent: Heredity and effect of infectious disease	Normal
6	Otosclerosis	Present: Heredity, results of fork tests. Absent: Effect of infectious disease or pregnancy	Increased

In studying Table 43, it is seen that the first four cases tabulated all showed the presence of heredity as a factor in the loss of hearing; in addition, the first three had some element present which was the direct etiologic cause—either an infectious disease or pregnancy. In Case 11, in which the history of heredity was present in addition to the raising of the lower tone limit, the calcium content was at the lowest normal limit. The condition in this patient was diagnosed clinically as a chronic middle ear catarrh.

Case 16, in which the patient presented a history of heredity and active syphilis, and which was a definite case of syphilitic nerve deafness, the calcium content was normal. Case 3, which was diagnosed as otosclerosis from the results of the tuning fork tests but which had no history of heredity, presented normal calcium findings in the blood. Case 8, which was clinically diagnosed as chronic middle ear catarrh and which presented none of the factors necessary to a diagnosis of otosclerosis, showed a normal calcium content in the blood.

From the before-mentioned case reports, their analysis and the tabulated summaries, we feel justified in believing that the finding of an alteration of the calcium content in blood, examined after a fasting period of several hours, is strong corroborative evidence of the presence of otosclerosis in a patient who presents a loss of hearing clinically and a history of deafness in one or more blood relatives. When the onset of a loss in hearing is coincident with some infectious disease or pregnancy, and the patient presents a raising of the lower tone limit or a prolonged bone conduction—or both—then an otosclerosis is to be suspected if the blood shows either an increase or a deficiency in the calcium content, regardless of whether the factor of heredity is present or not. The probability is stronger when the calcium content is decreased.

In accordance with this, therefore, we would consider Cases 1, 7, 9, 10 and 11 as cases of otosclerosis. In Case 20, while the factor of heredity is present, the calcium content of the blood is normal; we therefore consider the condition not otosclerosis, but acoustic nerve deafness, a condition entirely distinct from any hereditary influence. Case 3, which we had diagnosed as otosclerosis from the results of the fork tests alone, showed a normal calcium content in the blood, and our clinical diagnosis is therefore considered incorrect.

FURTHER OBSERVATIONS IN THE LITERATURE

Kobrak [1] attributes the cause of otosclerosis to a deficiency in the calcium retention in the body. Kauffman, Creekmur and Schultz [2] fed a series of rats on diets deficient in fat soluble vitamin A and calcium. These rats, when examined, showed bone changes which had a fundamental resemblance to the bony skeletal changes found in rickets. What is especially of interest in connection with our findings is that the following changes were noted in the temporal bone. There was a bowing of the footplate of the stapes and marked proliferative changes

1. Kobrak, F.: Versuche zur Otosclerosenbehandlung auf aetiologischer Grundlage, Therap. d. Gegenw. **19**:421, 1917.

2. Kauffman, A. B.; Creekmur, F., and Schultz, O. T.: Changes in the Temporal Bone in Experimental Rickets and Their Relations to Otosclerosis, J. A. M. A. **80**:681 (March 10) 1923.

in the region of the anterior margin of the oval window. There was a definite involvement of the annular ligament and a replacement of the normal bone by spongy bone. A second series of rats were fed on a diet deficient only in fat soluble vitamin A. These showed changes analogous to the foregoing but decidedly less marked. The calcium was present to a greater degree in the bones of these rats. The authors conducting the experiments call attention to the fact that otosclerosis is probably a deficiency disease. While the deficiency of calcium is noted, they believe that the most important etiologic factor is the vitamin deficiency of fat soluble A.

51 West Seventy-Third Street.

LATERAL SINUS THROMBOSIS WITHOUT ELEVATION OF TEMPERATURE

J. W. HOLDERMAN, M.D.
Clinical Assistant, Otological Clinic, Rush Medical College
CHICAGO

Striking fluctuation in the temperature curve is recognized as the outstanding clinical symptom of lateral sinus thrombosis. In the more typical cases, these fluctuations range from subnormal to 104 and 106 F., and down to subnormal, often within a period of less than twenty-four hours; they are usually associated with chills and a corresponding increase in pulse rate. The clinical phenomenon is explained by the morbid change taking place within the sinus, the sudden pyrexia indicating the entrance into the blood stream of septic material from the broken down thrombus.

An afebrile type of sinus thrombosis occasionally occurs. In such cases, when an obliterating thrombus is present, symptoms may be produced which are traceable to disturbed intracranial circulation, such as headache, nausea, vomiting and optic neuritis. But in the absence of these symptoms, thrombosis may not be recognized unless discovered accidentally at the time of mastoid operation or revealed at necropsy. The afebrile course has been explained by the aseptic character of the thrombus, by the attenuated or low virulence of the infection, or by the discharge of pus into the mastoid cavity through a fistula in the sinus wall with the distal ends of the clot remaining firm.

In this paper, an effort is made to present a review of the cases of afebrile sinus thrombosis which have been reported in the literature. Altogether, we have been able to collect thirty cases which come under this classification. To these we have added the report of a case studied in this clinic.

REVIEW OF THE LITERATURE

In 1899, Warnecke[1] reported a case with the diagnosis of right chronic suppurative otitis media, cholesteatoma, empyema of the mastoid and possible sinus thrombosis. Operation showed a thickened sinus wall covered with granulations and the sinus completely obliterated by an organized thrombus. While under his observation there had been no temperature fluctuations either before or after the operation. However, there was a history of initial chills which led him to believe there may have been an associated fever at that time.

1. Warnecke: Arch. f. Ohrenh. **48**:189-197, 1899-1900.

In 1888, W. A. Lane[2] was the first to treat successfully septic thrombosis of the lateral sinus by ligature of the internal jugular vein and removal of the septic thrombus. Several years prior to this, obliteration of the lateral sinus had been found at necropsy, although the case of Warnecke, of an apparently atypical lateral sinus thrombosis, is the first on record to come to operation. It was held by Sedillot, Hewett, Stacke, Heydenreich and others, according to Warnecke, that ultimate connective tissue obliteration of the sigmoid sinus not producing symptoms and not recognized, except at necropsy, was so seldom seen that it could not influence the bad prognosis of sinus phlebitis from aural origin.

Another type of lateral sinus thrombosis is described by Alexander,[3] in 1905, and again by Welty,[4] three years later, in which the existing pathology marked an unusual local condition, found accidentally during operation on the mastoid. The lateral sinus in each was covered with granulations from 2 to 3 mm. thick. After curetting these away, the sinus was found to contain pus with firm clots at both ends. There was no fistulous discharge of pus through the sinus wall into the mastoid cavity. The clots were not disturbed and the jugular not ligated. The process in Alexander's case complicated a long-standing suppurative otitis media; in the case of Welty, the aural discharge was of five months' duration and severe headache on the same side had been more or less persistent from the onset. In neither case were any symptoms of sepsis present. The only explanation offered for the existence of such morbid changes without septic signs, was a pneumococcus infection. The organism was isolated from the pus found in the sinuses. These changes are examples of the way in which Nature sometimes responds to prevent extension of the infection to the meninges.

In 1906, Schroeder[5] described a case of afebrile sinus thrombosis following a chronic suppurative otitis media, which ended in recovery of the patient, after running a feverless course for four weeks. Both ends of the thrombus were solid with a suppurating central part. The organism isolated from the sinus was *Staphylococcus aureus.*

In 1907, Uchermann[6] reported the case of a child who had developed an acute suppurative otitis media and mastoiditis. Slight headache was present at the beginning. Pyemic symptoms were absent, but rigidity and pain in the neck were present. A mastoid operation was

2. Lane, W. A.: Brit. M. J., 1890.
3. Alexander: Arch. f. Ohrenh. **64**:89, 1905.
4. Welty: California State J. M., (Feb.) 1908.
5. Schroeder: Ztschr. f. Ohrenh. **52**, 1906.
6. Uchermann: Arch. f. Ohrenh. **72**:263, 1907.

performed on the eighth day of the illness. An abscess within the sigmoid portion of the lateral sinus was found, which drained through a perforation of its wall into the mastoid cavity. The pus from the sinus contained streptococcus and staphylococcus. There were a few small evening rises in temperature following the operation, but otherwise the course of the disease was normal.

Another case was that of a young adult who had a chronic suppurating ear for three years. Operation showed a sclerosed mastoid, the antrum filled with pus and cholesteatoma. A small fistula filled with pus above and behind the antrum led to the dura of the cerebellum which, when exposed, was found to be covered with granulations. One month later a second inspection of the wound was made. The lateral sinus, except the sigmoid sinus, was obliterated by an organized thrombus, from which a fistulous tract extended into the antrum. Posterior to the sinus, the infection had produced a caries of the occipital bone. The situation gave no clue to an involvement of the lateral sinus. Fever was absent throughout the entire course. No culture report was made. Moure [7] mentions a similar case and terms it "suppurative phlebitis of the lateral sinus which drains through the mastoid into the middle ear and thence into the external ear."

In 1907, Blau [8] mentioned the case of an aged adult who had suppurative otitis media of seven months' duration, a severe occipital headache of three months' duration, and a recent mastoiditis. Operation revealed pus in the mastoid cells and antrum; an extradural abscess; the lateral sinus wall covered with thick granulations and perforated, allowing pus to discharge into the mastoid cavity from the central part of the thrombus, and the ends of the thrombus firm. The highest temperature, 37.5 C. (99.6 F.), was on the third day after the operation. No bacteriologic report was made.

Nager,[9] in 1907, described, in a young adult, an acute suppurative otitis media with a perisinous abscess and an organized thrombus within the lateral sinus which ran a feverless course. Streptococcus was found in the pus from the mastoid.

Voss,[10] in the same year, wrote of a young adult who developed an acute suppurative otitis media and mastoiditis. Severe headache on that side was a prominent symptom. Pus and granulations in the mastoid and antrum, an extradural abscess, and an organized thrombus of the lateral sinus were found at operation. Clinically, there was no hint of a lateral sinus thrombosis; 37.5 C. was the highest temperature

7. Moure: Rev. hebd. de laryngol **1**:43, 1905.
8. Blau: Arch. f. Ohrenh. **74**:200, 1907.
9. Nager: Ztschr. f. Ohrenh. **53**:162, 1907.
10. Voss: Ztschr. f. Ohrenh. **53**:316, 1907.

and occurred after the operation. Voss did not advise ligation of the jugular vein in such cases.

About this time, Uffenorde [11] reported a case of infectious thrombophlebitis of aural origin with a symptomless course. A lateral sinus complication was not hinted at during the ear infection. An operation was performed because the suppurative secretions from the middle ear had persisted for four weeks. There were no mastoid symptoms. The temperature was never above normal and at times subnormal. Operation showed empyema of the mastoid, a perisinous abscess, a fistula through the wall of the lateral sinus, and a thrombus within the sinus with the central end organized and the peripheral end softened. The pus from the sinus was sterile.

In 1909, Bondy [12] described one case of chronic suppurative otitis media of tubercular origin in a child. Mastoid symptoms were present for one week. A large subperiosteal abscess was opened and a fistula filled with pus and granulations was found leading into the antrum. The lateral sinus wall was discolored and thickened. The sinus was obliterated by a firm thrombus except at the central portion where pus found an outlet through a perforation in the sinus wall. Tubercular nodules were discovered on the cerebellar dura. The temperature course was normal except for a high mark of 37.8 C. (100 F.), reached on the third day before the operation.

In another patient of Bondy, there was an acute suppurative otitis media in a child, followed very early by mastoid symptoms. The findings at operation were a subperiosteal abscess and thickened walls of the lateral sinus with its lumen obliterated by an organized thrombus. There were no symptoms referable to a sinus involvement. The thrombus was sterile.

Leidler,[13] in the same year, reported a bilateral, subacute, suppurative otitis media with left osteoperiostitis of the mastoid process in an adult. Operation verified the latter, and in addition revealed a pachymeningitis externa, perisinous abscess and thrombosis of the lateral sinus. The thrombus was firm except the sigmoid portion, which had softened and broken through the wall at this point to drain into the perisinous abscess. Fever had been absent throughout, but severe headache over the left temporal and occipital regions associated with vertigo had been present for three months. No bacterial findings were given.

In another instance, Leidler found essentially the same morbid changes at operation on a child. The clinical course varied slightly,

11. Uffenorde: Monatschr. f. Ohrenh. **41**:661, 1907.
12. Bondy: Monatschr. f. Ohrenh. **43**:641, 1909.
13. Leidler: Arch. f. Ohrenh. **81**:177, 1909.

in that the otitis media was acute, the headache and tenderness over the mastoid were mild, and two days before the operation light chills and fever were present. At no other time was the temperature above normal. No bacterial report was made.

Auerbach,[14] in 1912, described a case of afebrile sinus thrombosis and cerebellar abscess complicating acute otitis media and mastoiditis in an adult. The mastoid was operated on sixteen days after the ear began to discharge. During that period all signs of sepsis were absent. Twenty-four hours after the operation, a steady rise in temperature occurred, associated with headaches of increasing severity and signs of meningeal irritation. A second operation revealed a thrombosis of the lateral sinus and a cerebellar abscess. No culture report was made.

OTITIC THROMBOSIS WITHOUT SYMPTOMS

In 1914, Canfield[15] reported a case of otitic thrombosis of the sigmoid sinus without symptoms. This occurred in conjunction with an acute suppurative otitis media. A few days after the aural discharge began, the patient developed considerable discomfort in the head on that side, which persisted up to the time of operation. The sigmoid was completely thrombosed from the knee down to the jugular bulb. At no time was the temperature above normal. No culture report of the thrombus was made.

Day,[16] in 1915, reported six cases of spontaneous cure of unrecognized thrombosis of the lateral sinus, not suspected until found accidentally during operation on the mastoid. One gave a history of previous suppurations of the middle ear, the last exacerbation being of seven months' duration; two were of two months' duration, and three were decidedly chronic. In each, the sinus was totally obliterated, five having completely organized clots, while one was in a state of beginning organization. In three there were absolutely no past or present symptoms referable to a sinus involvement. In the remaining three, the following exceptions might be taken to a complete absence of all signs; namely, (1) the presence of a temperature of 100 to 103 F. for a period of from four to five weeks in one case; (2) a child in the throes of scarlet fever, with a temperature reaching 106 F. on three different occasions, part of which may have been due to a sinus involvement, and (3) the presence of an almost constant and persisting headache on the same side as the discharging ear and involved mastoid. However, regarding the two patients with a temperature, Day states that any infection of the thrombus, if present, must have been of a mild or attenuated nature,

14. Auerbach: Laryngoscope **22**:1367, 1912.
15. Canfield: J. Michigan M. S. **13**:390, 1914.
16. Day: Laryngoscope **25**:757, 1915.

otherwise the clot would have broken down instead of organizing. A bacterial examination of the clots was reported in only two cases, both of which were sterile.

Three additional cases from his series are mentioned, in which the distal ends of the clot had organized and an intervening sinus abscess had formed and broken through the necrotic sinus wall to drain into the mastoid cavity. In none of these were the symptoms of sinus thrombosis present.

Of the nine cases of Day, quoted in the foregoing, seven ran an afebrile course.

In the same year, Dighton [17] described a case of symptomless lateral sinus thrombosis, following a chronic suppurative otitis media of seven years' duration. The temperature and pulse were normal throughout the course. Headaches were absent. All other forms of treatment having failed, a mastoid operation was performed. Four days later, the discharge being quite profuse, the wound was explored with the discovery of a minute sinus leading back to the region of the sigmoid. A second operation showed the lateral sinus to be filled with a greenish mass. The infection was due to a bipolar diphtheroid bacillus, probably *Bacillus auris*. At no time was there anything beyond the aural discharge to indicate an involvement of the sinus.

Lillie,[18] in 1915, also gave an account of a case of lateral sinus thrombosis in a child, aged 3 years, in whom the condition ran a strictly aseptic course, following an acute suppurative otitis media and subperiosteal abscess. The sinus was obliterated by an organized thrombus.

He described another patient, an adult, in whom, three days after a radical mastoid operation, prior to which time there had been no signs of sinus involvement, chills and fever suddenly developed. A second operation revealed a large thrombus of the lateral sinus. A dull headache over the vertex had been a prominent and constant symptom for some time.

In 1917, Kaufman [19] stated he had had five cases of lateral sinus thrombosis occurring without symptoms. Only one case, however, was afebrile and was associated with acute suppurative otitis media and mastoiditis, in which headache of a rather severe type was an outstanding symptom. Of the other four, three complicated acute suppurative otitis media and mastoiditis, and one chronic otitis media. Headache was prominent in all but one of the acute cases. Their temperatures ranged from 100 to 106 F. at some time during the

17. Dighton: Liverpool M. Chir. J. **35**:317, 1915.
18. Lillie: J. Michigan M. S. **14**:183, 1915.
19. Kaufman, Q. S.: New York M. J. **106**:1216 (Dec. 29) 1917.

course prior to operation. The thrombi in all were broken down and disintegrating. One, he stated, was infected, but the particular organism was not given.

In 1920, Baum [20] reported four cases of thrombosis of the lateral sinus without sepsis. Acute or subacute suppurative otitis media was present in three and chronic otitis media in one. Severe, constant headache, radiating particularly over the same side, was marked in only one case. Two were afebrile, in which actual sinus abscesses, walled off above and below by firm clots, were found draining through necrotic sinus walls into the mastoid cavities. Two had temperatures of from 101 to 102 F., respectively, before the operation. In these the sinuses contained firm, obliterating thrombi, but from one a few drops of pus was expressed from a small opening in its wall. Hemolytic streptococci were found in the abscesses of the first two. The clots in the others were not examined for organisms.

Haymann [21] was able experimentally to produce sinus thrombosis in animals. Friedenwald,[22] drawing on the conclusions of the former, states that thrombi in their earliest stages may contain micro-organisms, or the latter may enter the thrombi subsequently from without or be brought to the thrombi by the blood stream. The number of organisms contained in the thrombus vary greatly, but the ends are usually most free of their presence. A moderate number of organisms does not prevent organization of the thrombus. Experimentally infected thrombosis shows a marked tendency to spontaneous recovery, and even malignant forms, in which the lateral wall was destroyed, at times showed organization, vascularization and recanalization of the sinus. He insists that the thrombus must not be looked on as noninfected because of the spontaneous recovery, although the infection was probably of low virulence; further, that such occurrences are not rare in man.

The following case report is added, illustrating the typical course of an afebrile sinus thrombosis.

CASE REPORT

History.—W. S., a man, aged 30, was admitted to the ear clinic of the Central Free Dispensary in July, 1923. In May, 1922, the patient developed influenza. Five days later an earache began on the right side, which was followed in forty-eight hours by a spontaneous rupture of the tympanic membrane with a purulent discharge. The discharge had persisted continuously over the fourteen months' period. Almost simultaneous with the advent of the aural discharge, he began to be annoyed by a dull, heavy feeling and at times excruciating pain over the occipital region. These attacks became more frequent and extended over the parietal and temporal areas on the same side

20. Baum, H. L.: Ann. Otol., Rhinol. & Laryngol. **29**:44 (June) 1920.
21. Haymann: München. med. Wchnschr. **58**:2443, 1911.
22. Friedenwald: Ann. Otol., Rhinol. & Laryngol. **68**:1090, 1913.

as the suppurative otitis media. During the last eight months, they were more or less continuous, even when he remained quiet, and were relieved only by opiates. Tinnitus aurium on the right was marked and had persisted from the onset. Chills, fever, and vertigo had been absent throughout the entire course.

Examination revealed a well developed man, apparently in good physical and mental condition. Microtia was present on the right. The external aural canal on this side was narrow and filled with thick purulent secretion. There was no sagging of the posterior-superior wall. The region of the right tympanic membrane was obscured by a mass of granulations, the left was normal. The hearing acuity on the right was markedly diminished and all functional tests were characteristic of a middle ear process. The Barany tests gave normal responses. There was definite tenderness over the right mastoid process, but none could be elicited over the jugular. The temperature was 98.4 F. The optic disk showed no alterations from the normal.

The patient entered the Presbyterian Hospital the next day with a diagnosis of right subacute suppurative otitis media, mastoiditis, and probable intracranial involvement, the latter being made on account of the presence of the persistent headache.

The white blood count was 8,100; the blood pressure, 120 systolic, 80 diastolic, and the right mastoid by skiagraph dense and clouded. The blood culture was negative after forty-eight hours; that of the aural discharge showed pure *Staphylococcus albus* after forty-eight hours.

Two days after admittance to the hospital, the patient was operated on by Dr. Shambaugh. The mastoid was found to be sclerosed, with an occasional small pneumatic cell filled with a brownish seropurulent exudate. The antrum was opened and the dura freely exposed above. Softened bone was found around the tip and along the posterior inner wall, which led to a large abscess cavity the size of a small hickory nut. The lateral sinus wall was thickened, lusterless and gray. Aspiration was performed, but no fluid obtained. The sinus was then opened extensively and found to contain an obliterating thrombus, consisting of a thick grumous material and in part of granulations. There was no bleeding from either end. Anteriorly and in the depths, the bony wall seemed to be eroded. The wound was closed with an iodoform pack in the usual manner. The jugular vein was not ligated, as it was believed that the solid thrombus was as satisfactory a barrier against a systemic infection as any ligature of the vein would be.

Cultures of the material from the thrombus revealed no growth on bouillon or plain agar after twenty-four, forty-eight and seventy-two hours.

At no time during the twenty-four days in the hospital was the temperature above normal except the first and second days following the operation, when it once reached 99.4 F. The recovery was uneventful except for a somewhat delayed healing process, and more especially the persistence of the characteristic headache, which lasted in varying degrees for approximately two months following the operation.

SUMMARY

A critical summary shows that of these thirty-one cases of afebrile lateral sinus thrombosis, fourteen complicated acute middle ear disease; fourteen, chronic middle ear disease, and three were not designated. Fourteen had sinus abscesses, while seventeen had firm or totally organized thrombi; in eleven, headache was present. Regarding the microorganisms found in the sinus contents, three showed streptococci, two pneumococci, one *Staphylococcus aureus*, one staphylococcus and strep-

tococcus, one *Bacillus auris,* one tubercle bacillus (?), and five none. No report was made concerning the micro-organisms found in the sinus content of seventeen of the patients.

The question of bacteremia in the afebrile type is naturally of negative interest only. The same is probably true of the culture findings of the thrombus, except in that form in which the center of the clot is infected and discharging purulent material into the mastoid cavity through a fistulous opening in the necrotic sinus wall. On the other hand, the careful investigations of Leutert,[23] Suepfle,[24] Libman,[25] Gruenig,[26] Hasslauer,[27] Duel and Wright,[28] revealed that the streptococcus is responsible in the majority of cases for intracranial complications, such as septic or febrile sinus thrombosis, suppurative labyrinthitis, brain abscess, etc., and further, that the staphylococcus, pneumococcus, and other organisms more rarely gave rise to these.

Kerrison [29] states that in acute suppurative diseases of the middle ear or mastoid, there is greater danger of intracranial complications developing from a pure rather than from a mixed infection. That these complications occur not infrequently from mixed infections in chronic middle ear suppurations is due to the fact that mixed infections are greater in relative and actual frequency in chronic suppurative otitis media, and not because the virulence of the organisms is greater in the mixed type.

In our own case, *Staphylococcus albus* was isolated in pure culture. Hence it would seem apparent that the determination of the bacterial content of the secretions from the middle ear may have an important bearing on the prognosis of possible complications.

CONCLUSIONS

1. The occurrence of lateral sinus thrombosis is perhaps more frequent than might be suspected from the temperature curve.

2. An afebrile type does occur, but is relatively rare.

3. This type may occur as a complication of acute suppurative otitis media and acute mastoiditis as well as of the chronic form.

4. Persistent headache, when present, is an important symptom, particularly in the absence of other signs.

---

23. Leutert: Arch. f. Ohrenh. **46**:190.
24. Suepfle, cited by Libman: Arch. Otol. **37.**
25. Libman: Arch. Otol. **37.**
26. Gruenig: New York M. J., (June 5) 1909.
27. Hasslauer: Internat. Zentralbl. f. Ohrenh. **5**:15.
28. Duel and Wright: New York M. J., (Oct. 30) 1909.
29. Kerrison: Diseases of Ear, Ed. 2, Philadelphia, J. B. Lippincott Company, 1921.

5. The bacterial findings of the secretions from the middle ear may be of value in the prognosis of intracranial complications.

6. In the afebrile form, the thrombus, if completely organized, is sterile in most cases. If the middle portion is broken down and discharging into the mastoid cavity or a perisinous abscess, the firm distal ends are noninfective.

7. The aseptic type of thrombi do not need to be disturbed at the time of operation, nor is the ligation of the jugular vein essential to recovery.

MICROCOCCUS PHARYNGITIDIS-SICCAE

REPORT OF A CASE OF SEPTICEMIA *

M. A. BLANKENHORN, M.D.

AND

M. K. KING, A.B.

CLEVELAND

REVIEW OF THE LITERATURE

Von Lingelsheim [1] first mentioned this organism as one that was occasionally found in the nasopharynx. He described it as a small gram-negative diplococcus, easily differentiated from others of the same group by sugar reactions, and the firm adherence and dryness of the colonies which could not be rubbed up into a suspension.

Elser and Huntoon [2] encountered the organism in patients who were under examination for data for their "Studies on Meningitis." They made observation on two strains which were placed under this heading, as they corresponded culturally to those described by Von Lingelsheim. [1] The difference was that the Elser and Huntoon strains fermented saccharose and the Von Lingelsheim strain did not.

Jordan [3] describes the organism as a small gram-negative coccus, found on the mucous membrane of the respiratory tract, which grows at room temperature as well as at 37 C.; it forms white, firm, adherent colonies and ferments saccharose, lactose and mannite.

Hiss and Zinser [4] mention the organism as first described by Von Lingelsheim, and later by Elser and Huntoon, and reproduce the Elser and Huntoon sugar reactions.

Recovery of the organism from two patients has been reported from the literature, so far as we have been able to determine. Schultz [5] reported a case of acute vegetative endocarditis due to the *Micrococcus pharyngitidis-siccae*. The organism was obtained from blood cultures

---

* From the Medical Service and the Medical Research Laboratory of Lakeside Hospital.

1. Lingelsheim: Klin. Jahrbuch **15**:409, 1906.

2. Elser and Huntoon: J. M. Res. **20**:398, 1909.

3. Jordan: A Text-Book of General Bacteriology, Ed. 7, Philadelphia, W. B. Saunders Company, 1922, p. 251.

4. Zinser: Textbook of Bacteriology, Ed. 5, New York, D. Appleton & Company, 1922, p. 535.

5. Schultz, O. T.: Acute Vegetative Endocarditis with Multiple Secondary Foci of Involvement Due to the Micrococcus Pharyngitidis-Siccae, J. A. M. A. **71**:1739 (Nov. 23) 1918.

taken on four occasions during life. Kretschmer and Hufnagel[6] reported a kidney infection due to this organism.

ETIOLOGY

The organism described in this report was isolated from five blood cultures, each taken on successive days from a patient in the medical ward of Lakeside Hospital. It was gram-negative, slightly smaller than a staphylococcus and occurred singly and in groups, but more often in pairs. The blood plates, made with approximately 1 c.c. of the patient's blood, showed from 50 to 280 colonies to each plate. These deep colonies grew in a cross or Y shape, and were uniform in size.

The colonies were irregular in outline, very dry and extremely tenacious, and a grayish white. They grow readily on plain agar, but more luxuriantly on blood agar; they have no odor; there is no liquefaction of gelatin and no indol produced and they grow well at room temperature. Agar slant cultures grow in distinct colonies which do not become confluent in early cultures. The growth could not be emulsified in saline solution, but remained in lumps and shreds when scraped from slants by means of a platinum wire.

GROWTH

Old agar slant cultures were extremely difficult to transplant. It was necessary to transplant to broth; allow two or three days' incubation and two or three transplants before a twenty-four hour broth culture of the usual density could be obtained.

The growth in broth was distinctive. Early broth cultures tended to grow in granular colonies in a pellicle on the surface and sides of the tube. Gradually the pellicle settled to the bottom of the tube, leaving the supernatant fluid clear. After transplanting for several months, the broth cultures became more uniformly cloudy. Broth cultures could be centrifuged down, the sediment resuspended in saline solution and shaken vigorously with glass beads, thus obtaining a suspension suitable for animal inoculation and agglutination reactions.

REACTIONS

Agglutination reactions were carried out at intervals during the six months following isolation of the organism. The patient's serum, which had been stored, did not at any time agglutinate the organism in any dilution. Dilutions were used from 1:4 up to 1:1,000. The sugar reactions of our organism, as compared with those previously reported, are shown in Table 1.

---

6. Kretschmer, H. L., and Hufnagel, C. J.: Kidney Infection Due to Micrococcus Pharyngitidis-Siccae, J. A. M. A. **82**:1850 (June 7) 1924.

Because no investigator has recorded the pathogenesis of this organism, the following studies were undertaken. For animal inoculation, a 10 c.c. broth, cultured for twenty-four hours, was centrifuged; the sediment shaken with glass beads was resuspended in 4 c.c. of physiologic sodium chlorid solution.

CASE REPORT

A man, aged 32, Lithuanian, a machine operator, was sent to the hospital after being ill for two or more weeks with a fever supposedly typhoid.

History.—The patient said that he had never been ill and had been quite well until three weeks previously, when he "caught cold," had a chill and felt sick all over. Following the chill he had fever, headache and abdominal pain, all

TABLE 1.—*Sugar Reactions*

	Dextrose	Maltose	Levulose	Saccharose	Lactose	Galactose	Mannite	Inulin	Dextrin	Litmus Milk
Blankenhorn and King....	A	A	A	A	0	0	0	0	A	0
Kretschmer and Hufnagel	A	A	A	A	A	0	A	..	..	..
Schultz.....	A	A	..	A	..	..	0	..	..	0
Jordan.....	..	..	..	A	A	..	A	..	..	..
Elser and Huntoon; Hiss and Zinser.....	A	A	A	A	0	0	0	0	0	..
Lingelsheim.....	..	..	..	0	..	..	..	..	..	..

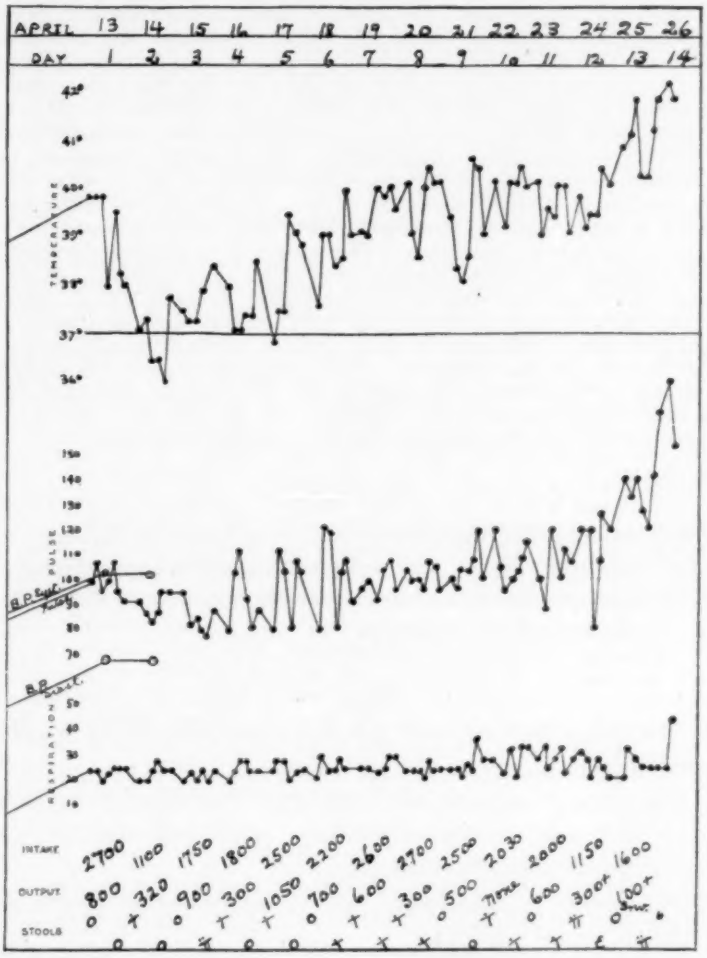
TABLE 2.—*Results of Animal Inoculation*

Animals	Site of Inoculation	Amount of Suspension	Result
Three white mice...	Peritoneum	1 c.c.	No apparent effects, 7 days
Reinoculated.....	Peritoneum	1 c.c.	No apparent effects, 7 days
White mouse.....	Base of tail	0.5 c.c.	No abscess formed
Rabbit.....	Ear vein	1 c.c.	No apparent effects, 7 days
Guinea-pig.....	Peritoneum	1 c.c.	No apparent effects, 7 days
Dog.....	Femoral vein	3 c.c.	First day, 11 a. m., inoculated; 2 p. m., nauseated, vomiting, drinking much water; 4 p. m., dog appeared quite sick Second day, much improved, temperature and pulse normal Fifth day, apparently normal and recovered Eighth day, reinoculated, 3 c.c. suspension; necropsy performed several weeks later showed no evidence of infection

of which persisted up to the time of his entrance to the hospital. Shortly after the onset of the illness, the patient developed pains in the lower extremities, which were relieved by massage. He had no bowel disturbance, and had taken cathartics on several occasions. On the day prior to admission he had severe abdominal cramps and diarrhea, up to ten passages a day, one of which was said to contain blood.

Physical Examination.—This showed that the patient was very ill and uncomfortable, and that there were no positive physical signs for any diagnosis other than infection. More particularly, there was no evidence of "cold" in the nose or throat and no abnormal signs in the lungs. The abdomen was slightly distended and was generally tender, but the left upper quadrant showed greater tenderness and slightly more muscle spasm and rigidity than could be found elsewhere. No masses or viscera were palpable, but the spleen could be percussed to the costal margin. In the flank and left costovertebral angle there was much tenderness but no edema or swelling. The temperature on admission was 40 C. (104 F.); pulse 100; respirations 25; blood pressure 65. The leuko-

cyte count on admission was 19,000; hemoglobin 70 per cent. The urine contained a trace of albumin and 0.75 per cent. of sugar with acetone and diacetic acid. Blood cultures on admission were negative until the third day of incubation; blood sugar 0.17 per cent. A differential count made the next day showed 80 per cent. polymorphonuclears. The sugar which was found in the first specimen of urine was never found thereafter, although the patient was able to take large amounts of carbohydrates. Acetone and diacetic acid likewise disappeared as soon as more food was taken.



Clinical record of a case of septicemia due to *Micrococcus pharyngitidis-siccae*.

Because the first blood cultures produced an organism resembling a common contaminator, cultures were repeated on the eighth, ninth, ten and eleventh days, and all showed the same organism in increasing numbers. Prior to the discovery of the positive blood cultures, the patient was regarded as having some pyogenic infection localized to some viscus or region in the upper abdomen, and the most likely diagnosis was that there was a paranephritic abscess. On the third day in hospital the patient coughed up mucopurulent sputum and

there were numerous râles in the base of both lungs. A microscopic examination of the sputum showed a mixed flora, and Fontana stains showed a few fusiform bacilli and spirochetes. After careful cleansing of the mouth, subsequent examination of the sputum showed no spirochetes or bacilli. The patient continued ill, but none of the signs or symptoms which had previously suggested a plausible diagnosis developed to a point at which a definite conclusion was possible.

On the sixth day of the disease, enlargement of the heart developed, with systolic murmurs at the apex and base, but the pulse rate remained under 100. The temperature, which had been at 40 on admission, dropped to subnormal on the second day, but on the third day it began to rise, so that on the seventh day it again reached 40. It remained more or less at that level until the twelfth day and then went rather abruptly to 42 and continued there for a few hours before death. The pulse rate throughout the disease continued in the neighborhood of 100 until the terminal rise of temperature, when the pulse reached a point as high as 180. Respirations were seldom over 25. Except for positive blood cultures there was no laboratory procedure on blood, urine or stool, and no roentgen-ray studies that were of value in making a complete diagnosis. With the terminal rise in temperature petechiae developed over the entire body, no doubt due to septicemia. The patient died without developing any sign or symptom that might disclose the origin or localization of the fatal infection. Necropsy was refused, but the region at the left flank, which was supposedly the seat of the abscess, was thoroughly needled after death but no pus was discovered. Likewise the liver and the subdiaphragmatic spaces were needled, but no pus was obtained. That a septicemia existed is shown conclusively by the five positive blood cultures, all showing the same organism and in increasing amounts. Endocarditis may possibly have developed, but no heart signs were precise enough to make a diagnosis certain.

COMMENT

It was evident that the patient died of a blood infection of *Micrococcus pharyngitidis-siccae,* and because the disease began with a "cold" and later developed into purulent bronchitis, we assume the respiratory passages were the portal of entry.

CONCLUSION

1. The patient died apparently from a blood infection of *Micrococcus pharyngitidis-siccae.*

2. The cultural characteristics and sugar reactions of the organism found in our case correspond to those previously reported for the *Micrococcus pharyngitidis-siccae.*

3. The serum of the patient had no agglutinating power for the organism.

4. The organism is not pathogenic for the usual laboratory animals.

PERFORATION OF THE FAUCIAL PILLARS

REPORT OF CASE *

EDWARD H. CAMPBELL, M.D.
PHILADELPHIA

A patient, with a perforation of the right anterior faucial pillar, recently came to my attention in the Ear Clinic of the University of Pennsylvania Hospital. Cases of this kind, although not extremely rare, have been but infrequently placed on record, and I have taken the opportunity that this case affords of reviewing and summarizing the literature on the subject, using my own case as a text.

REPORT OF CASE

M. B., a girl, aged 9 years, white, had a history of considerable illness, consisting of granulation of the eyelids, pneumonia and mastoiditis at 1 year of age, eczema of the scalp and face a short time later, a severe condition of the throat at 2 years, and chickenpox at 6 years. The exact diagnosis of this throat condition was greatly in doubt. The mother stated that the child's throat was sore on the right side for three months, but that the patient was not confined to bed although she had frequent convulsions. Apparently no operations were performed, but, according to the mother, the sore throat seemed to "eat the tonsil away." After that, the patient had no further trouble with the throat, but at the age of 3 years the left ear started to discharge pus and continued to do so ever since. She had been treated for five months for eczema of the face and scalp with considerable improvement. A negative blood Wassermann test was obtained three months previous to this examination.

The patient had two younger brothers and one sister, all healthy and apparently normal. There was no history of abnormalities in either parent.

Physical Examination.—A well developed girl of poor color and with eczema of the face and scalp was seen. Her eyes were the seat of marked strabismus. The left ear showed a thick, foul purulent discharge but the hearing was only slightly impaired. The throat presented small and somewhat embedded tonsils, the right one being closely adherent to both anterior and posterior pillars. Through the right anterior pillar about opposite the middle of the tonsil there was a narrow oval perforation about 1 cm. long and 2 mm. wide, with smooth edges. The rest of the examination was negative.

ETIOLOGY

The etiology of perforations of the faucial pillars and of the soft palate has been the subject of considerable discussion and decided difference of opinion. McKenzie,[1] of London, in discussing their origin, says:

Perforations of the anterior pillars of the fauces are often bilaterally symmetrical, and this feature, combined with an absence of scarring has led

---

* Read (by invitation) before the Section on Otology and Laryngology of the College of Physicians of Philadelphia, Jan. 21, 1925.

* From the Department of Otology, the University of Pennsylvania.

1. McKenzie, D.: Diseases of the Throat, Nose and Ear, London, William Heinemann, 1920, page 24.

to the belief that they must be of congenital origin. As against this view, there is the undoubted fact that Sir Robert Woods and other reliable observers have seen them in process of formation in severe scarlatina. That this is probably the origin of all such perforations is supported by the circumstance that they have not, so far, been reported as occurring in young infants, and that the patients have or have had enlarged tonsils, the swelling of which during the attack causes the perforation by pressure atrophy.

He also says that perforation of the hard or soft palate is a syphilitic manifestation. Tilley [2] says:

There can be little doubt that sometimes perforations of the anterior pillars are congenital in origin and they may be associated with bifid uvula and other local evidences of mal-development. In other instances such perforations may result from ulcerative lesions occurring in the course of scarlet fever. Finally there are perforations of the fauces due to the lesions of tertiary syphilis.

REVIEW OF THE LITERATURE

The literature on anomalies of the soft palate shows that only thirty-three cases of perforation have been reported, including both the anterior and the posterior pillars.

POSTERIOR PILLAR

Those of the posterior pillars are very rare, only seven having been recorded up to the present time. The first of these was reported by Schmiegelow.[3] His patient showed a perforation in the right posterior pillar, oval in form, 1 cm. in length and 4 mm. in width. The borders of the opening were sharply defined and there was no evidence of cicatrization.

Jurasz,[4] in 1891, recorded a second case, a perforation in the upper part of the left posterior pillar with no trace of cicatricial tissue. He also described a case of perforation of the right anterior pillar.

In the next year, Hajek [5] reported two cases. One showed bilateral symmetrical perforation in the posterior pillars. The other case presented a double opening in the same posterior pillar, the upper one being round and the lower one in the form of a fissure. Hajek also is credited with a report of two cases of perforation of the anterior pillar.

Rethi,[6] in 1893, reported a case of perforation in the left posterior pillar. This one also showed a smooth regular border with absence of any scarring.

---

2. Tilley, Herbert: Diseases of the Nose and Throat, London, H. K. Lewis & Company, 1919, page 354.
3. Schmiegelow, E.: Monatschr. f. Ohrenh. **19**:35, 1885.
4. Jurasz, A.: Die Krankheiten der oberen Luftwege, 1891, page 118.
5. Hajek: Internat. Klin. Rundschau. **6**:1302, 1892.
6. Rethi, L.: Wien. med. Bl. **16**:193, 1893.

Raoult and Finck,[7] in 1898, presented a case of bilateral elongated perforation of the posterior pillars. The openings were symmetrically placed, and this was largely their reason for putting the case in the class of congenital anomalies.

Collett and Troullieur[8] noted, in 1905, in a man, aged 82, two perforations of the left posterior pillar and one perforation of the right. These openings were smooth and regular, with the long axis running parallel with the muscular fibers. There were no signs of scarring and the patient could not remember having a sore throat at any time. These authors consider the condition as one of congenital origin.

ANTERIOR PILLAR

Perforations of the anterior pillars are more frequent than those of the posterior. In the majority of instances they are bilateral and symmetrical, and almost always are found to be free from adhesions or contractions. They are usually untraceable to either congenital or acquired syphilis, and are considered by most authors to be of congenital origin.

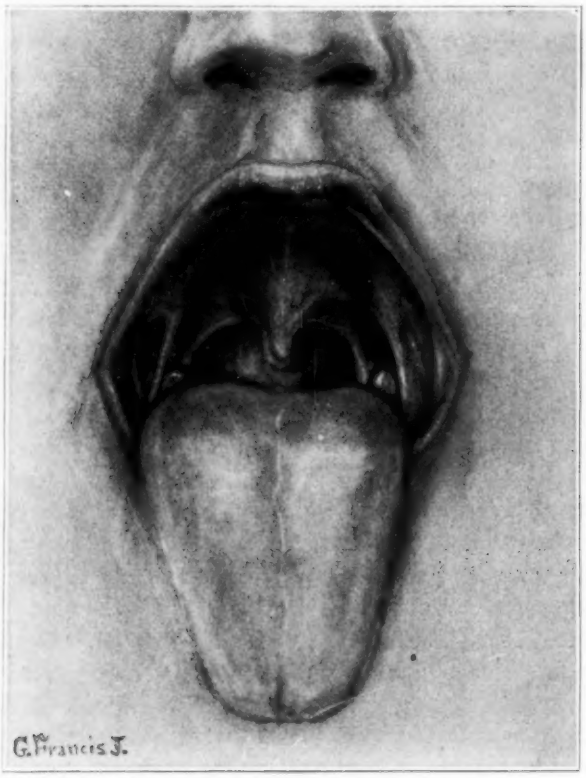
One of the first cases on record was reported by J. Solis Cohen.[9] He reported such a case in 1878, the examination of the patient showing an elongated oval aperture in the anterior pillar of each side just above the lingual attachment. The rest of the throat was free from any signs of disease. He says that an occasional anomalous condition of the palate consists in a separate mucus investment of the palatoglossus muscle in the anterior fold of the palate, thus leaving an opening which might be mistaken for ulcerative destruction of the palatal tissue. In the same article Cohen referred to a somewhat similar case reported by Wolters, in 1859, which appears to be the only one recorded up to that time. In Wolter's case the anterior pillar of each side was split, a cord stretching obliquely downward and slightly outward from the uvula to the side of the root of the tongue. There were no traces of cicatrization.

The next case, reported by Lefferts,[10] was a girl, aged 19, who had a perforation the size of a small pea through each side of the velum palati. The edges of the openings were smooth and rounded and free from cicatricial tissue. The patient never had had any severe affection of the throat and remembered that the openings had always existed. Lefferts considered the case one of congenital origin, due to arrest of development.

---

7. Raoult, A., and Finck: Arch. internat. de laryngol. **11**:395-397, 1898.
8. Collett and Troullieur: Med. mod., Paris **16**:317, 1905.
9. Cohen, J. Solis: New York M. Rec. **20**:45 (July) 1878.
10. Lefferts, G. M.: Med. News **40**:12, 1882.

Chiari [11] records a case showing an oval perforation in each anterior pillar, with smooth borders and no traces of cicatrization. The perforation on the right was larger than the one on the left. The patient had a history of an attack of throat trouble which might have been ulcerative in nature. Chiari concluded, however, that the perforation was due to arrest of development.



Perforation of right anterior faucial pillar

Claiborne [12] reported, in 1885, a case with a hiatus in the anterior pillar of the right side with congenital absence of both tonsils. The hiatus was not complete but consisted of a furrow with edges not sharply defined and no signs of cicatricial tissue. There was no history of previous throat trouble.

Schapringer [13] was apparently the next man to report a similar case. His, also, was a one-sided perforation of the anterior pillar with a

11. Chiari, O.: Monatschr. f. Ohrenh. **18**:140 (Aug.) 1884.
12. Claiborne, J. H.: Am. J. M. Sc. 490 (April) 1885.
13. Schapringer, A.: Monatschr. f. Ohrenh. **18**:204, 1884.

rudiment of the left tonsil and absence of the right. The patient had had a severe attack of diphtheria in early life, but Schapringer was inclined to believe that the anomaly was congenital in nature.

Fowler,[14] in 1889, recorded bilateral symmetrical perforations of the anterior pillars. These openings were unusually large and the tonsils were reduced to mere stumps from which grew, right across the base of the tongue, a broad and elevated ridge of tonsillar tissue (the lingual tonsil?). The patient had had a severe phlegmonous tonsillitis during an attack of scarlet fever some years previously. Fowler considered perforations of the anterior pillar as always acquired. He thought that if careful examination were made of the margins of the openings, cicatricial tissue would be found, showing them to be due to ulceration. In all the patients he had observed, he had obtained a history of scarlet fever or recurrent attacks of quinsy, and this led him to look on all these perforations as caused by suppurative or phlegmonous inflammation in the tonsils. He even goes so far as to say that the lesion is most probably a sign of antecedent scarlet fever.

Toeplitz,[15] in 1892, described a patient with an opening in each anterior pillar symmetrically placed, the right one slightly larger than the left. He considered them to be of congenital origin.

In the next year, Broeckaert[16] reported a case with symmetrical openings in the anterior pillars, oval in form, with no evidence of scarring and with only the remnants of tonsils. He placed this case in the class of anomalies due to arrest of development.

Morrice[17] cited four cases of perforation of the anterior pillars. One of these followed scarlet fever and three patients gave a history of diphtheria.

Seifert[18] reported an elongated perforation of the upper part of the left anterior pillar with rounded borders and no evidence of cicatricial tissue.

Meijes,[19] in 1894, presented a patient having an elongated oval perforation of the right anterior pillar with no signs of cicatricial tissue, and with a negative previous medical history. He thought the condition due to arrest of development.

Garel,[20] in 1894, reported a case of bilateral perforation of the anterior pillars and a case of unilateral perforation, without evidence of any scarring. He considered these openings due to faults in development.

---

14. Fowler, Walter: Lancet **2**:1113, 1889.
15. Toeplitz, M.: Ztschr. f. Ohrenh. **23**:268, 1892.
16. Broeckaert: Rev. de Laryngol. **13**:577, 1893.
17. Morrice, G. G.: Lancet **2**:142, 1892.
18. Seifert: Rev. de Laryngol. **14**:97, 1894.
19. Meijes, P.: Rev. de Laryngol. **14**:269, 1894.
20. Garel, M.: Rev. de Laryngol. **14**:489, 1894.

Three years later, Griner [21] recorded a case of a man, aged 21, with a large perforation of the left anterior pillar. This opening extended from a level of the base of the uvula to the lower extremity of the pillar, a distance of about 3.5 cm. The patient gave a history of trouble with the throat at an early age. Histologic examination of a section of the border of the perforation showed the presence of cicatricial tissue; so the lesion was considered not to be of congenital origin.

Ehrmann,[22] 1902, presented a patient with a circular opening 8 mm in diameter, in the soft palate. He considered the lesion congenital.

Grant,[23] in 1910, reported a perforation of the soft palate in a girl, aged 16 years. The opening was situated above and to the right side of the base of the uvula. The nature of it was undecided. In its neighborhood there was no such cicatricial tissue as would accompany a syphilitic perforation, but there was a history of traumatism that could have accounted for it, namely, an operation on the tonsils in early childhood.

Bumba,[24] twelve years later, presented a patient, aged 32, with symmetrical openings in the anterior pillars, the right one somewhat larger than the left and both situated opposite the superior extremity of the tonsil. The edges of the perforation were sharp and the surrounding tissue normal in appearance. The tonsils were of normal size, and the patient gave a negative Wassermann reaction. The lesion was believed to be of congenital origin.

Rouget,[25] in 1923, reported a case of multiple perforations of the anterior pillars. There was one opening in the right pillar 15 mm. long and 5 mm. wide, and two smaller ones in the left pillar, one above the other and separated by 1 cm. of apparently normal tissue. These perforations had a punched-out appearance and beneath them were somewhat hypertrophied tonsils. There was no history of hereditary or acquired syphilis and the Wassermann test was negative.

In the same year, Trinder [26] recorded a case of perforation of the soft palate with double uvula. The perforation, 1 cm. long and 0.5 cm. wide, was situated in the center of the soft palate. The uvulas were of normal size, symmetrically placed, lateral to the median line. From the history, the patient apparently had had the condition since birth. Trinder relieved the condition by grafting one of the uvulas over the perforation, thereby removing one uvula and closing the opening in the soft palate.

---

21. Griner, A.: Ann. d. mal. de l'oreille, du larynx (etc.) Paris **23**:128, 1897.
22. Ehrmann: Bull. et mém. Soc. de chir. de Paris **28**:410, 1902.
23. Grant, J .D.: Proc. Roy. Soc. Med. (Laryngol. Sect.) **3**:131, 1910.
24. Bumba, J.: Ztschr. f. Hals.- Nasen- u. Ohrenh. **1**:245, 1922.
25. Rouget, J.: Arch. internat. de laryngol. **29**:643, 1923.
26. Trinder, J. H.: Congenital Perforate Soft Palate and Double Uvula, with Repair of Perforation, J. A. M. A. **80**:914 (March 31) 1923.

ETIOLOGY

Nearly all the authors quoted have speculated on the cause of these conditions. Most of them believe the perforations to be of congenital origin. Almost all of the cases reported have been adults, and in these patients we are dependent on their often unreliable memory for the previous medical history of the case. If there had been a few cases observed in early infancy, before any catarrhal or ulcerative condition of the throat could have occurred, it would tend to prove more decisively the congenital nature of these perforations.

COMMENT

In the case I have reported, although the perforation had sharp smooth edges with no cicatricial tissue in its neighborhood, the previous medical history leads me to believe it was of inflammatory rather than of congenital origin. The tonsil beneath this opening was small, embedded, closely bound to the pillars by adhesions and with every appearance of having been actively diseased. It seems very possible that the condition could have been caused by the persistent inflammation of the right side of the throat which the child had had seven years previous to examination.

CONCLUSION

I have endeavored to collect all the recorded perforations of the faucial pillars that have appeared in medical literature. I realize that this paper offers nothing to alleviate the many ailments to which human beings are subject, but I hope that it is justified if only as a possible collective source of reference to conditions of this kind.

DIRECT BLOOD STREAM INFECTION THROUGH THE TONSILS *

M. TANAKA, M.D., AND S. J. CROWE, M.D.

BALTIMORE

Clinical experience has definitely established the fact that a chronic focus of infection in the abdominal organs, the teeth, the tonsils, the nasopharynx or the accessory nasal sinuses may give rise to general systemic disorders. The local manifestations in the eye, the optic, the auditory or other nerves; the kidney, the circulatory system or the joints are often more prominent than are those of the focus from which they originate. In other words, the classical symptoms of an abscess, such as pain, redness, swelling and impairment of function, are often of little value in the localization of the primary focus of infection. It is particularly difficult, for example, to enumerate the signs and symptoms of a chronic focus of infection in the tonsil in such a way that the examining physician may decide definitely that the joint or the eye symptoms in one patient are due to the tonsil and that similar symptoms in another patient are not due to the tonsil. If we can accept the complete disappearance of the clinical symptoms of infectious arthritis following tonsillectomy as evidence that the primary focus of infection was located in the tonsil, then a review of the history and examination notes in a series of such patients will demonstrate the absence of any local sign or symptom of chronic tonsillitis that was present in all cases. In some, the joint symptoms first appear a week or ten days after an acute tonsillitis; in others, there is no history of an upper respiratory infection for years preceding the onset of joint symptoms. In some, the onset is gradual and involves many joints from the beginning; in others, one joint is involved following an injury or strain, and soon afterward other joints become stiff and painful. The glands in the neck that receive lymphatics from the pharynx and tonsils are enlarged and tender in some patients, and are not palpable in others. The tonsils may be enlarged or may be atrophic and hidden from view by the pillars of the fauces. Solid or semifluid plugs of débris may be forced out of the crypts with suction or with pressure in almost every individual after the age of 10 years. Hyperemia of the mucous membrane of the soft palate and of the pillars is so commonly seen, particularly in those who use tobacco, that this sign alone is of little value. The recognition of a primary focus of infection in the tonsil that is responsible for a general systemic disorder with a

* From the Department of Pathology of the Johns Hopkins University.

secondary lesion in any of the locations mentioned in the foregoing must depend on a careful search for and elimination of foci elsewhere in the body; it is never justifiable to limit the examination to the upper respiratory passages. The diagnosis of chronic tonsillitis in many cases of this kind must be made by a process of elimination, and always in association with an internist.

There are two possible explanations of the lesions that may be located in parts of the body far distant from the original focus of infection: one is the absorption of toxins from the primary lesion,

Fig. 1.—A composite drawing of the human tonsil and the blood supply of the crypts.

and the other is the passage of living bacteria, from time to time, into the blood stream. In any given case it is difficult to prove which of these factors is responsible for the clinical symptoms, but the work of Drs. William S. Baer and Walter Baetjer, who have succeeded, in a large series of arthritic patients, in recovering a hemolytic streptococcus from an excised lymph gland, suggest that bacteriemia is not uncommon. The object of this paper is to call attention to the anatomic arrangement of the capillaries in the epithelium and to the

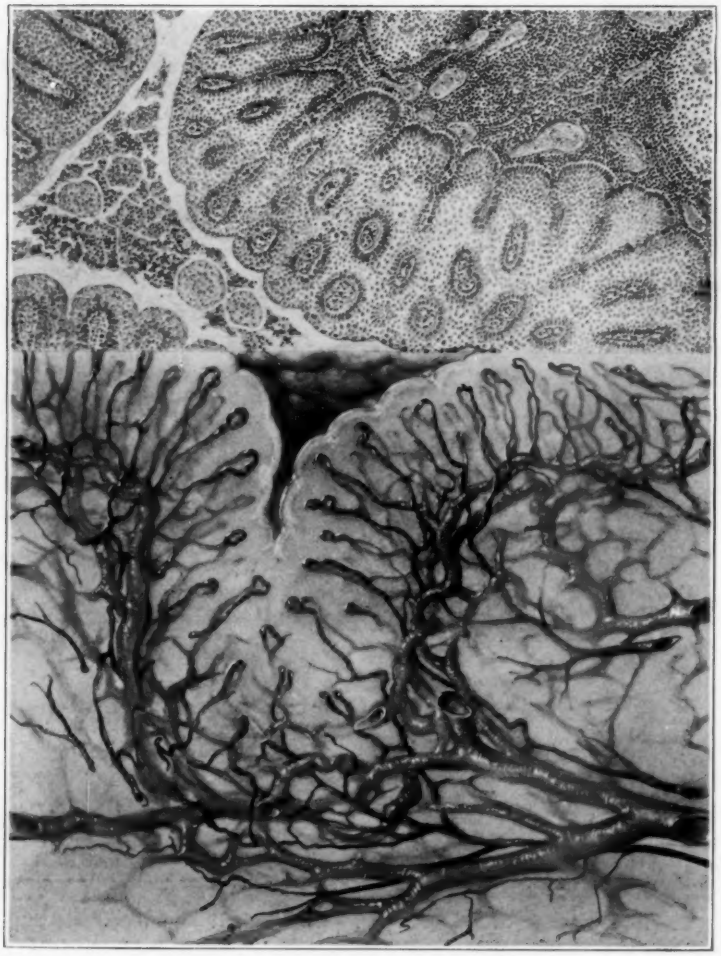


Fig. 2.—The capillaries in the crypt epithelium, the large veins under the epithelium and the appearance of the inside surface of a crypt.

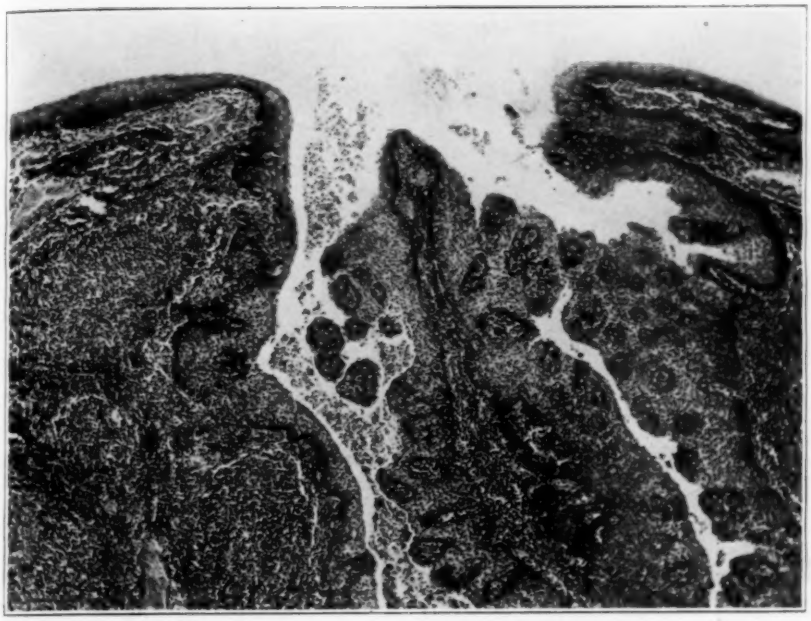


Fig. 3.—Section of a normal tonsil that shows the common orifice of two crypts. Note the difference between the epithelium on the surface and that lining the crypts.

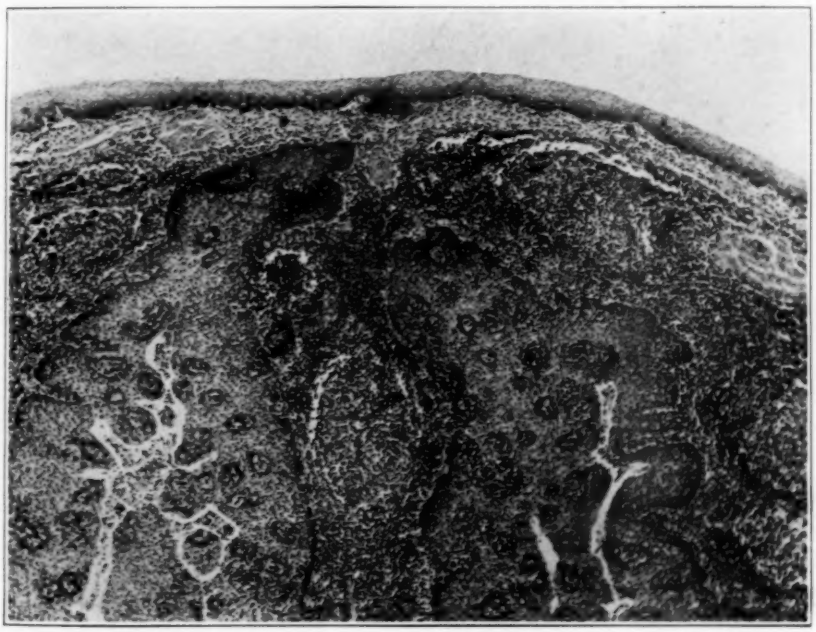


Fig. 4.—Section from the same series at a lower level. Note that in places only one or two layers of cells separate the capillaries from the lumen of the crypt.

Fig. 5.—The striking difference in the blood supply of the surface epithelium and that lining the crypt is evident.

Fig. 6.—The appearance of the tonsil just under the two crypts in Figures 3, 4 and 5. The absence of germinal centers and the distribution of lymphoid cells and blood vessels is normal for this area.

larger veins that lie just under the epithelium that lines the crypts in the tonsil, and to suggest that the joint lesions and the other general disturbances secondary to a chronic tonsillitis may be due to bacteriemia.

The illustrations require but little comment. Figure 1 is a composite drawing by Prof. Max Brödel, made from a study of many series of tonsils into which a dilute solution of India ink had been injected by way of the common carotid. The first step was to determine the general arrangement of the smaller vessels around a crypt; this necessitated the reconstruction in wax of a portion of a crypt wall. Camera lucida tracings of other serial sections were then made on thin

Fig. 7.—The capillaries shown in Figure 6 have collected into larger veins and the germinal centers have again appeared.

paper, the arteries and the veins were colored, and, when superimposed, these outlines give a very clear idea of the course and the arrangement of the capillaries. The nodular appearance of the inside of the crypt is caused by the projection of finger-like processes of epithelium into the lumen. An arteriole and one or more small veins occupy the center of each of these villous-like protrusions. This is shown in Figure 2.

The next few illustrations are selected from serial sections of a normal tonsil from a child aged 3 years. Figure 3 shows the common

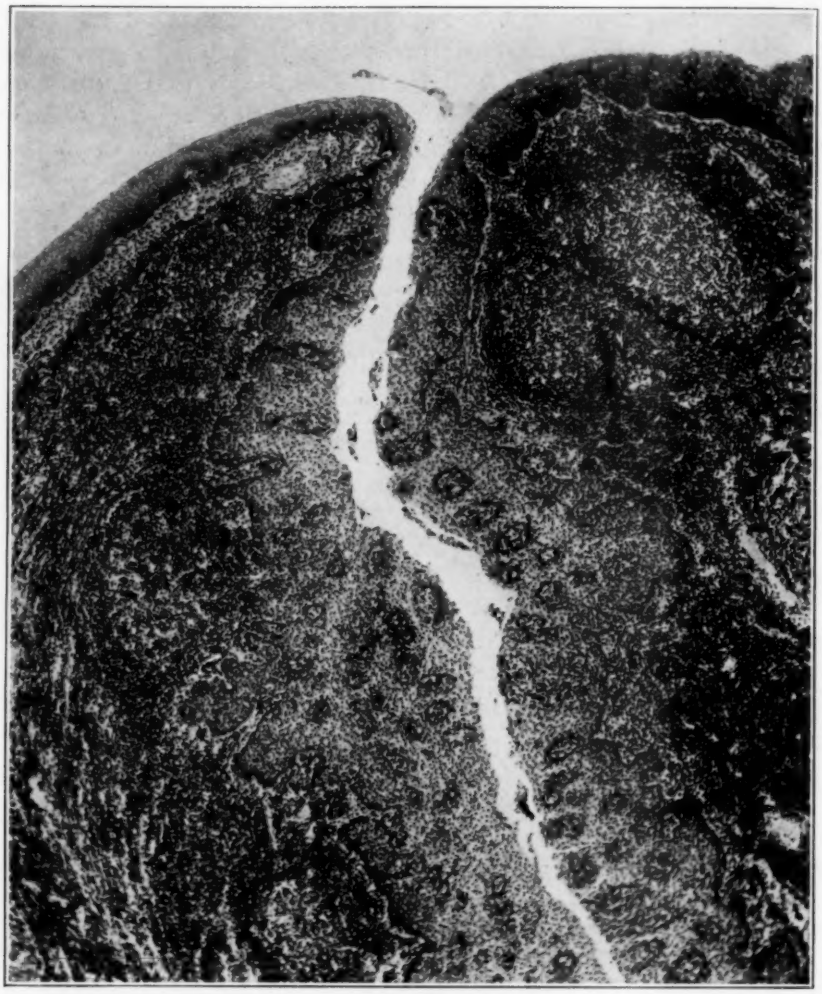


Fig. 8.—The orifice of a normal crypt in a child, aged 3 years.

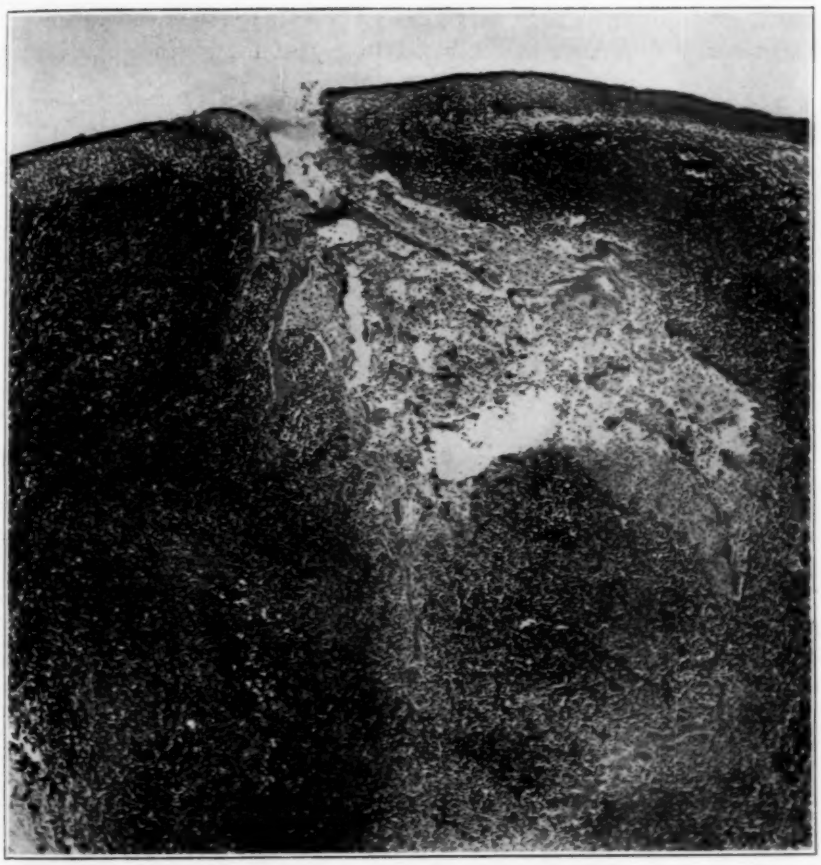


Fig. 9.—The orifice of a diseased crypt in a child, aged 3 years. The tonsil was removed six weeks after an attack of scarlet fever.

orifice of two crypts. Note the difference in appearance of the epithelium on the surface and of that which lines the crypts. Figure 4 is from a lower level; note the papillae that project into the lumen. The vessels may be seen pushing up into the epithelium; in places only one or two layers of cells separate these vessels from the lumen of the crypt. Figure 5 is further on in the series. The layer of fibrous tissue, which contains large veins, lies just under the surface epithelium. The striking difference in the blood supply of the surface epithelium

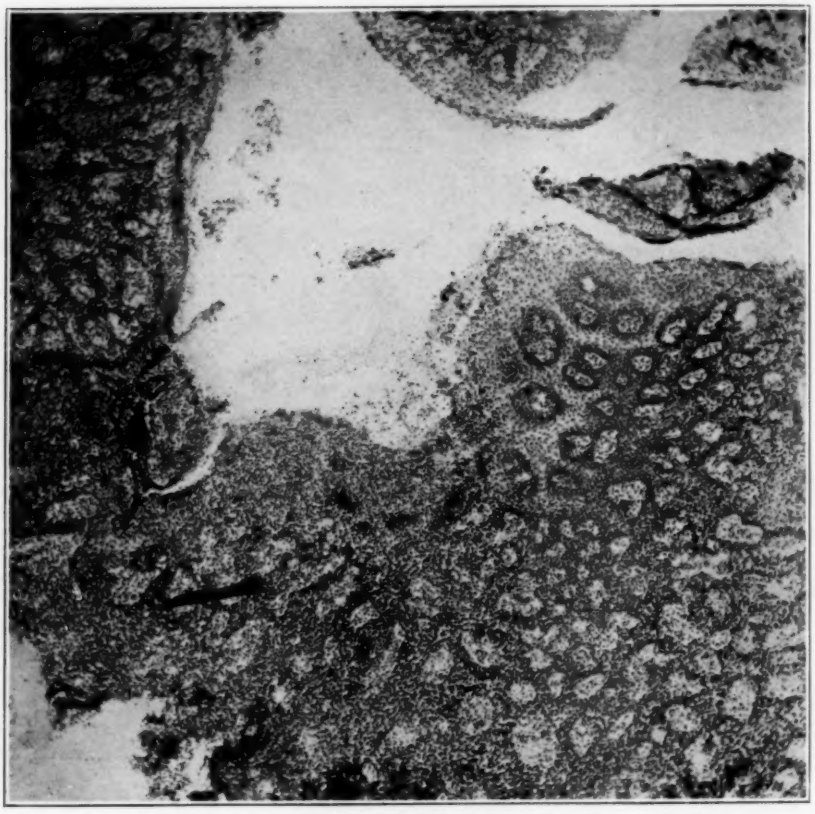


Fig. 10.—Local ulceration of the epithelium lining the crypt. This tonsil was removed from an adult who had infectious arthritis.

and of that lining the crypt is evident. Figure 6 shows the appearance of the tonsil just under the two crypts in the preceding illustrations. The capillaries from the crypt epithelium are collected into larger vessels. The absence of germinal centers and the distribution of the lymphoid cells and blood vessels is normal for this area. Figure 7 shows the capillaries in Figure 6 collected into large veins, and the reappearance of germinal centers.

Contrast Figure 8 with Figure 9. The orifice of a normal crypt in a child, aged 3 years, is shown in Figure 8. The orifice of a diseased crypt in a tonsil removed six weeks after scarlet fever is shown in Figure 9. This patient was also 3 years of age. The epithelium lining the crypt has been entirely destroyed, and there is a dense accumulation of inflammatory cells in the surrounding tissue. Numerous blood vessels have been destroyed by the inflammatory process. Manipulation of such a tonsil either at examination or at operation

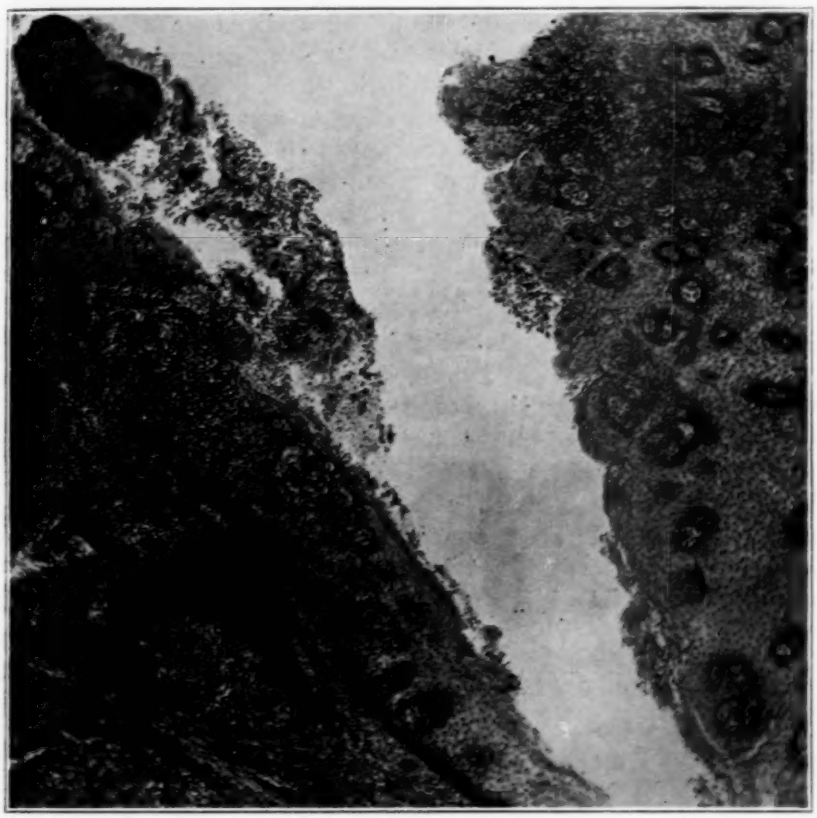


Fig. 11.—Local ulceration in a crypt. The tonsil was removed because of infectious arthritis. There were no clinical symptoms or signs of chronic tonsillitis. The tonsils were removed because no other focus of infection could be found.

probably dislodges bacterial thrombi and accounts for the increase in general symptoms that often follows such a procedure. Figures 10 and 11 show local ulceration of the epithelium lining the crypts. In each of these two patients the tonsil was removed at operation for the relief of a multiple infectious arthritis. A careful medical exami-

nation had been made and all other foci of infection had been eliminated. A complete disappearance of all arthritic symptoms within a year followed the removal of the tonsils and the adenoids, and no recurrence during the subsequent ten years, suggests that in these two patients the focus of infection was in this location, and that the organisms gained entrance to the blood stream through ulcerated areas in the walls of the crypts.

SUMMARY

In a previous paper,[1] published in April, 1924, it was shown by photographs of microscopic sections that the epithelium lining the crypt is more vascular than that covering the surface of the tonsil, and that the common pathologic lesion in chronic tonsillitis is a destruction of this epithelial lining. The reconstruction of an infected tonsil, illustrated in the foregoing, demonstrates very clearly the distribution of the capillaries in the epithelium and that of the large veins around the crypts.

The clinical evidence that many of the general systemic disturbances secondary to chronic tonsillitis are due to the localization of bacteria in the affected area is supported by the following facts:

1. The epithelium that lines the crypt in a normal tonsil has a rich capillary blood supply; the large collecting veins that surround each crypt lie just under the basement membrane.

2. A destruction of this epithelium, in whole or in part, is the most common microscopic finding in chronic tonsillitis. Often the lining epithelium is replaced with scar tissue; occasionally definite ulcers are found. In either case, large numbers of blood vessels have been thrombosed, and they afford a pathway for the entrance of bacteria into the blood stream.

---

1. Crowe, S. J.: Direct Blood Stream Infection Through the Tonsils, Arch. Int. Med. **33**:473-484 (April) 1924.

RABBIT RIB IN BRONCHUS OF INFANT

REPORT OF CASE WITH BRONCHOSCOPY AND RECOVERY

ELLEN J. PATTERSON, M.D.
Bronchoscopist to the Presbyterian Hospital, Allegheny General Hospital and the Western Pennsylvania Hospital
PITTSBURGH

REPORT OF CASE

M., a boy, aged 2 months, referred to me by Dr. A. W. Clark of Indiana, Pa., was admitted to the Presbyterian Hospital with the following history:

On Nov. 30, 1924, one week before admission, the child's mother entered the room and found him choking. A brother, aged 2 years, said that he had put a lump of salt in the baby's throat but later said it was a marble. As the baby continued to have choking spells, lasting from two to three minutes, Dr. Clark referred the case to me.

On examination, Dr. C. W. Morton found that the expansion was restricted over the right side. The breath sounds were quite harsh and all were accentuated over the upper left side. These findings led him to suspect early bronchitis or an obstruction from a foreign body in the trachea or right main stem bronchus.

As the only symptom observed after admission to the hospital was frequent choking spells, lasting from two and one-half to three minutes, in view of the preliminary roentgen-ray findings, I decided to do an esophagoscopy. This lasting for two minutes, was done without anesthesia, but no foreign body was found. The baby nursed without difficulty following esophagoscopy and had no reaction.

Dec. 11, 1924, two days later, Dr. J. W. Fisher reported that the roentgen-ray examination showed a long, narrow, opaque foreign body about 2 inches (5 cm.) in length apparently in the trachea (Fig. 1). There was emphysema of the right side of the chest with flattening of the diaphragm on the right side and displacement of the mediastinal contents toward the left. These roentgen-ray findings were taken to indicate that a foreign body was obstructing the right bronchus.

Without anesthesia, I introduced the laryngeal speculum and attempted to introduce the 4 mm. bronchoscope, but the tube met an obstruction on entering the trachea. I withdrew the bronchoscope to see what was interfering with its passage into the trachea when something white popped into the laryngoscope. Before the nurse could hand me the forceps, the foreign body disappeared. Dr. Morton, who was present at the bronchoscopy, suggested that the foreign body might have gone on the floor, but we did not see any foreign body. This, as we afterward discovered, was due to the fact that the white foreign body was invisible on the white tile floor in the subdued light.

As the physical signs were still present, probably due to tracheobronchitis, and we had not found the foreign body, we felt that repetition of the bronchoscopy was indicated, so proceeded to pass a 4 mm. bronchoscope. After searching carefully in the right bronchus for seven minutes and twenty-seven seconds, apparently unsuccessfully, I withdrew the bronchoscope. However, when the lights were turned on, we discovered the foreign body on the floor, a piece of rabbit rib which was very white and was 2 inches in length (Fig. 2). It had been propelled out of the tube by a cough, with such velocity that I had no idea what the foreign body was nor any conception of its size. The mother stated that they had eaten rabbit and hare two days before the accident.

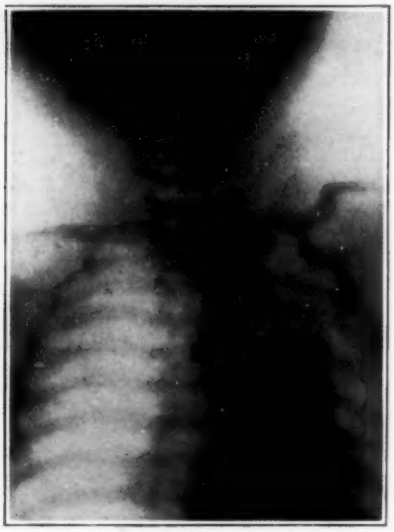


Fig. 1.—Roentgenogram showing rabbit bone in trachea and right bronchus of an infant, aged 2 months.

Fig. 2.—Rabbit rib (actual size) removed from right bronchus of the infant.

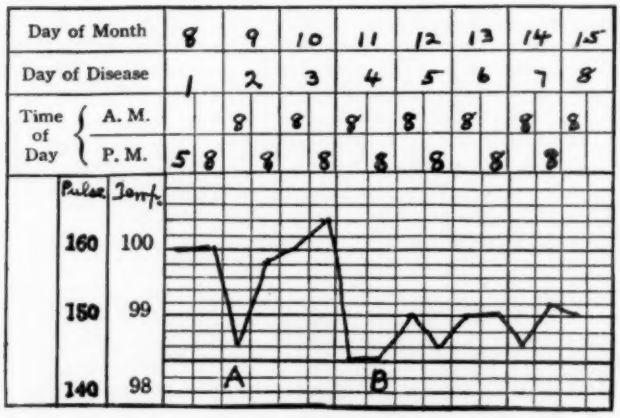


Fig. 3.—Temperature chart showing absence of reaction from esophagoscopy (*a*) and bronchoscopy (*b*) for foreign body in the infant.

After bronchoscopy, the baby nursed well and went to sleep. The child had a croupy cough, dyspnea with some indrawing and the breathing was quite noisy, but the color remained good. The greatest difficulty was that the baby seemed almost too tired to nurse. The temperature was normal (Fig. 3).

Fifty-six hours after bronchoscopy, the dyspnea seemed suddenly to clear up, the baby began to laugh and appear normal and he was discharged well seven days after admission and four days after bronchoscopy.

CONCLUSIONS

1. The surprisingly small reaction set up in the trachea and bronchus by this bone after twelve days' sojourn bears out the observation of Jackson:[1] "that bone is the only organic substance which does not set up severe inflammatory reaction in the respiratory tract."

2. Bronchoscopy through the mouth, if not prolonged, if done without anesthesia and with proper care, using a delicate, distally-lighted bronchoscope, is perfectly safe even in very young infants.

3. In view of this peroral bronchoscopy in an infant only 2 months of age, the routine practice in some parts of the world of doing a tracheotomy so as to put the bronchoscope in through the neck in all small children under 2 years of age, can be explained only on the basis of an armamentarium unsuited to bronchoscopy in infants.

4. This patient is, so far as I am aware, the youngest ever relieved of foreign body by bronchoscopy.

---

1. Jackson, Chevalier: Surg., Gynec. & Obst. **28**:201 (March) 1919.

Westinghouse Building.

TESTS OF HEARING OF FIVE HUNDRED AVERAGE EARS BY THE AUDIOMETER NO. 2-A *

DANA W. DRURY, M.D.
BOSTON

The present study was undertaken to determine standards or criteria of performance in various groups of persons who were to be regarded as having average normal ears, that is, without known and demonstrated failures of aural acuity. The real goal was the standardization of a technic of observation, which would permit the determination of significant relative measurements under the usual conditions of clinical practice. In the collation of large amounts of data, care must be exercised in recording and in interpretation. The average is but a mathematical quantity defining a linear relationship. The normal, on the other hand, is the individual whose departure from the average assumes insignificant proportion. Averages may result from widely divergent data or from those showing trifling variation. In translating averages to normalcies, authority of result depends on the range of departure of the individual components. For this reason, many of the curves here presented give both the mathematical averages and the curves of extremes, within which boundaries fall all of the observations of the group,

The instrument used in this series of observations was the audiometer No. 2-A (Western Electric Company),[1] which is essentially a vacuum tube oscillator, equipped with the necessary controls for regulating the frequency and the output. The oscillator generates single frequency oscillating electric currents which produce tones in the specially designed receiver. By means of the controls, tones of any one of eight pitches at octave intervals may be produced, and the intensity of these tones may be varied.

The most important interval in the scale is the octave. It is that which separates the highest notes of a peal of eight bells from the lowest. This interval has the property, shared by no other, of producing a smooth and harmonious result; when starting from any given note, one ascends or descends progressively by octaves throughout the auditory range.

With the audiometer in question, the pure tones of the oscillator are transmitted to the ear through the specially designed microphone.

---

* Contributions from the Evans Memorial, No. 86 A-42.

1. The author wishes to express his indebtedness to Dr. D. L. Lynch, also to the New England Telephone and Telegraph Company, through which company the machine was made available for this study.

Pressures can be varied at will by the operator and the threshold of pressure perception of the subject for each frequency determined.

In general, the technic followed in making these observations and measurements was, with but few exceptions, that advised by the Western Electric Company. The more significant precautions are:

1. The performance of the test in a quiet area was most important, as all the selected subjects were as near the normal in hearing as it was possible to obtain, and thus slight deviations were most significant.

2. The subject is placed with the back to the machine, touching nothing except the chair in which he sits. The eyes should be closed, or better, the patient blindfolded.

3. The patient is allowed to become familiar with the sounds of the machine before the record is taken. In other words, the eight frequencies are run through.

4. The dial is rotated anticlockwise until the tone has entirely ceased, the reading of the stationary calibrated scale being noted. Next, the dial is rotated clockwise until the sound is again perceived, and the dial reading is recorded. By successive rotations the threshold point can be fairly evaluated. An interrupter button permits a variation of the procedure, and, in conjunction with the resistance, permits the elimination of certain misleading elements arising equally from lack or excess of cooperation.

5. The foregoing method may be repeated as often as necessary to convince the operator of the correctness of his observations. Care should be taken, however, not to repeat the tests too many times, as the auditory nerve is readily fatigued.

6. Many of these measurements were checked with the Weber and the Rinné test.

In recording the results, the conventional diagram suggested by Fletcher has been used throughout. The dial of the instrument is calibrated to indicate the hearing loss in sensation units, and readings are transcribed directly on the chart. By a further convention, the observed hearing loss may be designated in terms of percentage, this representing the relative position of a point observed between the base line of normal hearing and the curve of total loss.

A total of 500 subjects have been examined in this study, of whom 245 were males and 255 were females. The average ages of these major groups was 18.4 and 18.5 years, respectively. That the averages as compiled might be thoroughly representative, ten groups of fifty subjects each were selected, embracing a wide diversity in social and physical condition. Further, as the study is preliminary in character, only children and young adults were selected, as the normal hearing failure

incident to advancing years would introduce an extraneous factor of variation and nullify the significance of the averages.

Due to the construction of the audiometer, individual readings differ by a unit of five. In compiling the averages, however, the arithmetical value as computed is recorded. In the establishment of any base line, rounded values should be used, commensurate with the readings of the instrument.

The combined data of the several averages may be presented most compactly in tabular form and are collected in Table 1.

TABLE 1.—*Combined Data of Several Averages* *

	Groups									
	Medical Students	Nurses	Telephone Operators, Untrained	Telephone Operators, Trained	Public School Children	Private School Children	Blind Children	Hospital School Children	College Students	Music Students
Group number	1	2	3	4	5	6	7	8	9	10
Sex—Male	50	..	..	..	25	50	22	22	50	26
Female	..	50	50	50	25	..	28	28	..	24
Age—Male	23.0	....	....	....	16.1	14.0	16.1	13.6	22.5	21.0
Female	....	22.0	18.0	23.0	15.3	....	17.6	14.1	....	17.0
C = 64—Right	24.8	19.6	20.4	9.6	18.4	13.4	19.4	25.2	6.9	13.5
Left	22.0	20.6	21.2	8.3	18.4	14.3	16.4	24.6	6.8	14.9
c = 128—Right	21.1	16.9	21.1	9.2	16.4	11.3	16.1	23.7	4.9	11.1
Left	20.4	18.6	21.2	7.6	16.6	11.8	13.7	24.9	5.5	11.6
c^1 = 256—Right	21.7	18.1	23.7	9.2	17.6	12.6	15.8	24.3	6.1	12.0
Left	20.8	19.7	22.7	9.5	18.2	14.1	13.0	24.8	5.9	12.3
c^2 = 512—Right	24.6	20.5	25.1	11.0	21.4	14.6	16.4	25.5	6.4	13.8
Left	22.5	21.6	26.4	10.2	21.2	15.4	15.6	27.1	6.6	13.7
c^3 = 1,024—Right	24.1	21.4	24.5	10.7	20.9	13.8	14.5	25.2	6.1	13.3
Left	21.9	23.2	26.6	11.1	20.8	15.4	15.2	29.3	6.7	12.2
c^4 = 2,048—Right	19.8	21.3	25.4	11.0	20.2	13.0	13.2	23.0	4.9	12.0
Left	18.1	22.0	24.8	11.6	18.4	14.5	15.0	25.6	5.9	10.8
c^5 = 4,096—Right	16.1	15.7	19.2	8.5	15.1	10.9	10.5	19.7	4.1	9.0
Left	9.4	19.4	18.4	8.2	15.7	11.7	13.7	20.2	4.0	9.1
c^6 = 8,192—Right	9.4	9.3	11.6	2.5	6.4	6.1	5.7	13.2	2.6	4.8
Left	7.9	10.0	11.1	2.8	7.3	6.9	7.2	13.7	2.8	5.2

* Group averages of audiometer readings.

For purposes of contrast and comparison, certain of the individual units may be considered together. These larger groups may be discussed seriatim.

CHILDREN

Group 1.—This group was composed of boys and girls from public high schools, a school for the blind, a school for the sick (orthopedic), and a private open-air school for boys. The serial averages are reduced to graphic form and assembled in Chart 1. It is interesting that blind

children present no evidence of compensation and do not hear more acutely than children in public or private schools. I do think, however, that their coordination is quicker. It is also noticeable that disease in young life plays its part in aural acuity, as is seen in comparing the

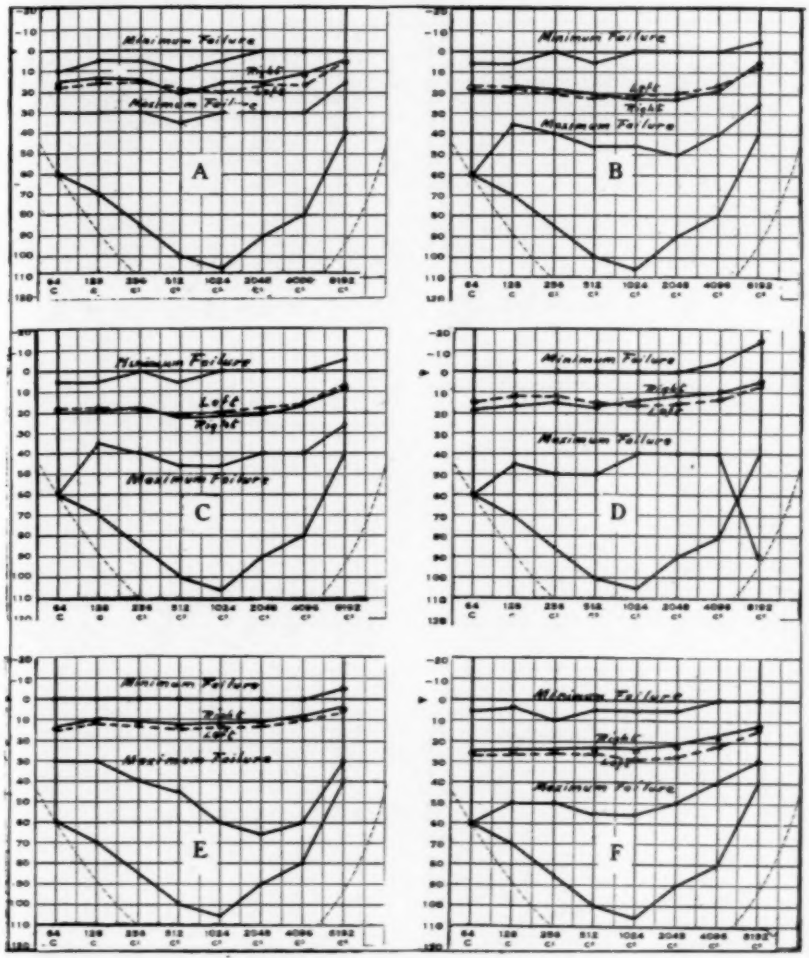


Chart 1.—Public high schools. A, boys; B, girls; C, combined curves. D, blind school; E, private out-door school; F, hospital school.

curve between the state school and that of a well known out-door private school. This difference has its effect in modifying the earning capacities in later life.

MUSIC STUDENTS

Group 2.—This group was composed of young adults and included a variety of instrumentalists and a vocal group. The several component

units and the composite are shown in Chart 2. The group of fifty students is divided into five subgroups, composed of ten studying the voice, ten the organ, seven the strings, thirteen the brass and ten the piano. The voice students seem to be the nearest to a straight line as

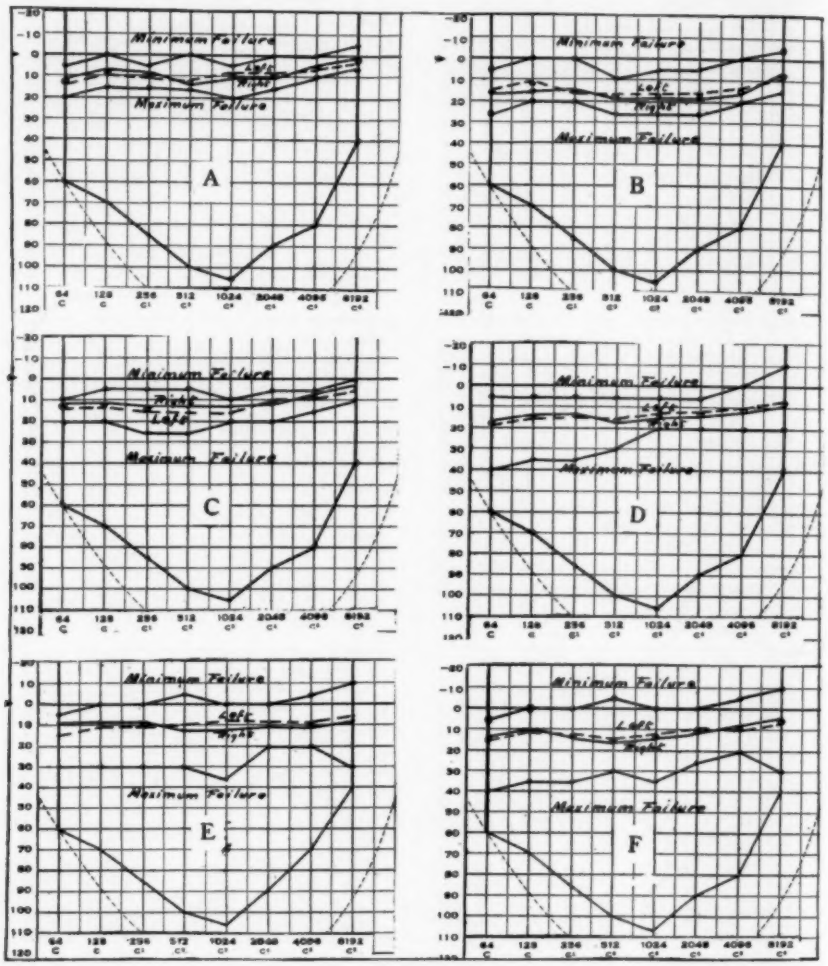


Chart 2.—Music students. A, voice; B, piano; C, organ; D, strings; E, brass; F, summation.

well as to have the better aural acuity. With the numbers involved, such differences as appear are hardly to be regarded as intrinsic. Many hundreds, if not thousands, of observations would be necessary to determine real differences in the educative quality of the different forms of musical production.

TELEPHONE OPERATORS AND COLLEGE STUDENTS

Group 3.—Two dissimilar groups are contrasted in the curves shown in Chart 3.

The first two graphs compare fifty untrained telephone operators having less than two weeks' training with fifty trained operators of

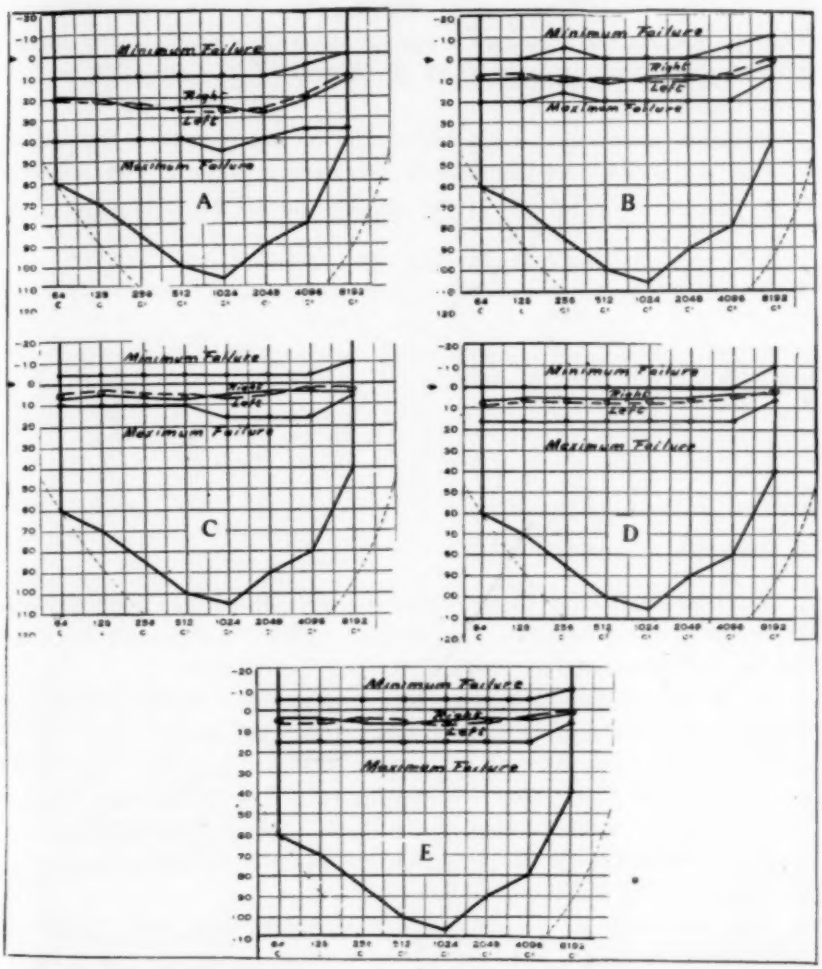


Chart 3.—A, untrained telephone operators; B, trained telephone operators; C, glee club; D, athletes; E, college students, average.

whom twenty-three had served less than five years, twenty-four between five and ten years and three over ten years. In the trained group, thirty wear the receiver on the left ear, eighteen wear it on the right ear, while two wear the receiver on either ear. The curve of the left is slightly better than the curve of the right ear. There is a marked

difference between the untrained and the trained operator. This is noticeable through all the intensities and especially so in the speech area.

The other curves show groups of athletes and of glee club men with a composite for the college group. The glee club exhibits the nearest approach to the straight line of normal acuity observed in the entire series of 500. There is a very close correlation at all intensities between the right and the left ear. The athletic group, drawn from university football, hockey, track and crew squads are a close second, and demonstrate clearly that athletics tend to acuteness of perception and to coordination.

With so nearly equal a sex division in the two groups, a comparison of some authority may be made to ascertain if there is any influence from this source. The data of the comparisons are given in Table 2.

TABLE 2.—*The Data of Comparisons* *

Frequency	Male			Female			Totals		
	Right	Left	Average	Right	Left	Average	Right	Left	Average
C = 64.....	16.4	16.1	16	18.1	17.7	18	17.1	16.8	17
c = 128.....	13.8	13.8	14	16.8	16.8	17	15.2	15.2	15
c^1 = 256.....	14.6	14.6	15	17.8	17.8	18	16.1	16.1	16
c^2 = 512.....	15.8	16.1	16	20.2	20.3	20	17.8	18.0	18
c^3 = 1,024.....	15.3	15.8	16	19.8	20.9	20	17.5	18.2	18
c^4 = 2,048.....	13.6	14.2	14	19.3	19.3	19	16.4	16.7	17
c^5 = 4,096.....	11.1	11.9	12	14.8	15.2	15	13.9	13.6	14
c^6 = 8,192.....	6.5	6.8	7	7.6	8.0	8	7.2	7.4	7

* Influence of right and left ear and of sex.

Curves A and B of Chart 4 give the sex influence in graphic form. If anything, the advantage is apparently slightly in favor of the male, but the differences are too small to be really significant.

While individual differences are considerable between the several groups, there is a certain definite similarity in the general form of the curve as defined for each ear. The data contained in Table 1 are shown in Curves C and D of Chart 4. Averages of the several groups for each ear are given by the solid lines of the graph. It is evident that there is a uniform tendency toward slightly lessened acuity in the low and improved perception in the high frequencies.

The similarity of the two ears is striking. The most significant inference to be drawn from this comparison lies in the obvious influence of physical health and nutritional level on aural acuity. There is an almost linear relationship, broken only when special training raises the individual group, as in the case of the trained operators. True, the slightly variable conditions of testing for the several groups rob the differences observed of any quantitative significance, but the tendency would seem to be unmistakable. So far as I know, this fact, patent as it should be, has never before been presented. In the present instance,

the objective character of the measurements enforces confidence in the conclusion.

A final graphic summary is shown in Curve E. One is constrained to accord some significance to the shape of this curve. Its interpretation must await a broader understanding of the complete mechanism

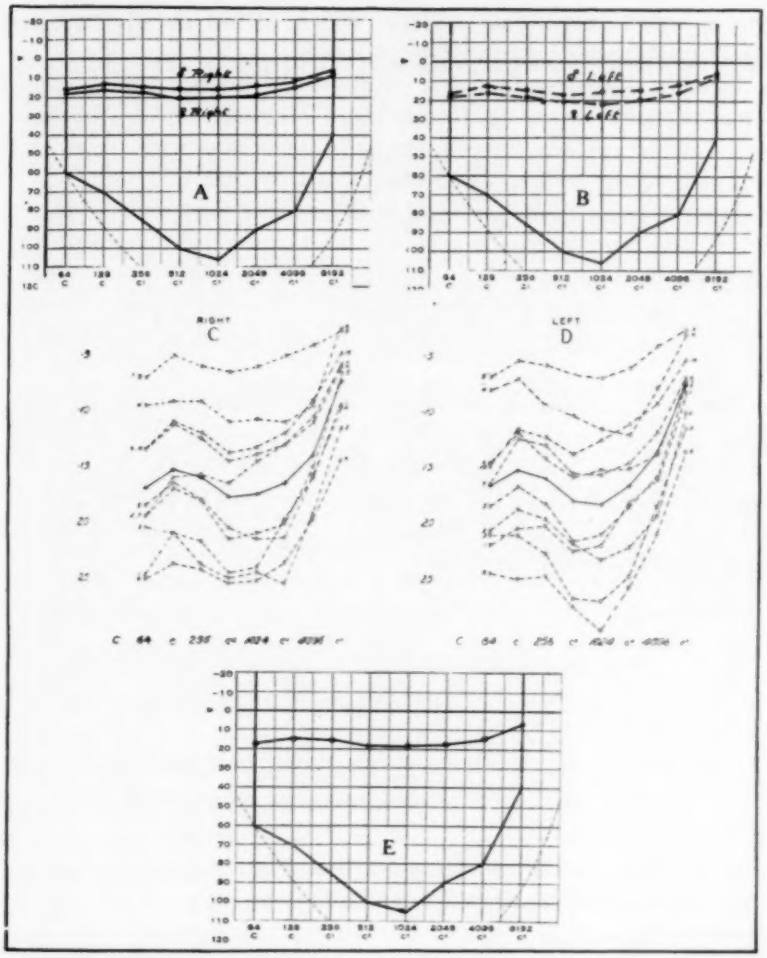


Chart 4.—Sex curves; A, right; sex curves, B, left; C, group comparison, right; D, group comparison, left; E, composite of all ears.

involved. Actually all of the points fall within a five unit zone—or less than the reading unit of the apparatus—with the sole exception of the results at a frequency of 8,192. The telephone receiver used in these measurements was returned to the Bell Telephone Laboratories for recalibration and it was found that at this frequency (8,192), the

intensity was five units more than that registered by the audiometer scale. Regardless of any previous calibration, the present curves are retained as typical of the existing mechanism.

The vertical translation from the normal base line is in part preferable to extraneous noise in the area where the tests were performed. The individual variations from each other of the component factors, would seem to indicate a possible influence which, as has already been stated, reflects training and general level of health.

Today much stress is placed on physical efficiency tests rather than on lung capacity, as was the former idea. Malnutrition, as a condition of undernourishment and low vitality, is more or less widespread in children and young adults. The effects are evident in later life. This condition is reflected in the aural acuity as was shown some time ago.[2] In the cases wherein this is a factor, the hearing improves with proper treatment, in some cases very markedly. It is a well-known fact that defective hearing is not so easy to detect as lowered vision. Frequently children are adjudged stupid when the trouble is entirely due to deficient hearing.

For the maintenance of vigorous health, the disciplined exercise of the body is of great importance. The growing child requires his metabolism to be stimulated adequately by the cooling powers of the open air, not reduced by the too close confinement in schools and by too long hours of a sedentary occupation. This holds good alike for the growing child and for the adult.

SUMMARY

1. So-called normal persons differ significantly in their keenness of hearing, and the tests frequently show disparity in the sensibility of the two ears.

2. High notes are apparently more readily perceived than low tones.

3. The upper limit of audition also varies considerably for different normal individuals.

4. The influence on health and training is illustrated by the curves of the athletes and the trained telephone operators.

---

2. Drury, Dana W.: Endocrine Dysfunction as a Possible Etiologic Factor in Progressive Deafness, Boston M. & S. J. **190**:1029 (June 12) 1924.

LAMB'S LUNG MANIKIN FOR BRONCHOSCOPIC STUDY AND PRACTICE *

M. JOSEPH MANDELBAUM, M.D.
Attending Bronchoscopist, Hospital for Joint Diseases
NEW YORK

The beginner in the study of bronchoscopic technic finds that obtaining suitable material for study of the bronchoscopic field is not the least of his problems.

Teachers of bronchoscopy in general, and Dr. Chevalier Jackson [1] in particular, emphasize the dangers attending the use of the special bronchoscopic armamentaria on the human subject without prolonged and painstaking studies on both the cadaver and the living dog. Dr. Jackson advocates daily practice of from one to two hours until several hundred hours have been passed in the use of bronchoscopic instruments for training both the eyes and the hands in the many delicate adjustments and manipulations necessary for the development of a satisfactory technic.

Cadaveric material and living dogs not being easily available, Jackson [2] has recommended the use of a specially prepared rubber tube to simulate the trachea which is held fast in a small iron vise, providing a simple, always at hand manikin for practice at odd moments. While this device permits a ready means to develop a certain amount of digital dexterity to a degree, and acquaints one with the proper method of holding the bronchoscopic tube and the intratubal use of the various endoscopic forceps and instruments in their relation to foreign bodies placed within the rubber "trachea," it is not designed to train the eye as to the color and consistency of real animal tissues, nor to give the student a proper idea of the formation of the trachea at its bifurcation at the carina and the location and direction of the main bronchi and their chief lobar subdivisions.

In searching for a better and more natural substitute for bronchoscopic practice, I considered the various materials easily obtainable in all sections, whether large cities or remote towns, and turned to the ruminant group and other "meat" animals most commonly handled by the average butcher shop. A comparative study of the lungs of the cow, pig and sheep led to the selection of the lamb's lung as most nearly approaching the human lung in its gross anatomy, coloring and dimensions. The

---

* Read on invitation before the Section on Otology and Laryngology of the College of Physicians, Philadelphia.

1. Jackson, Chevalier: Bronschoscopy and Esophagoscopy; A Manual of Peroral Endoscopy and Laryngeal Surgery, Philadelphia, W. B. Saunders Co., 1922, page 117.

2. Footnote 1, page 120.

ease with which a lamb's lung can be obtained, as well as its negligible cost, led to its final selection for the purpose intended.

COMPARATIVE ANATOMY OF LAMB'S LUNG AND THE HUMAN LUNG

In size, the fresh, eight months old lamb's lung approaches that of the human lung at puberty. The tracheal and bronchial dimensions are practically the same as is its mucosal coloring, with the exception of the length of the trachea, and thus a difference in the number of tracheal rings. As the distance from the cricoid cartilage to the carina in the lamb is about two and one-half times longer than in the human being, there is a corresponding increase in the number of its rings. The rings in the lamb are also somewhat stiffer than in the human trachea, their cartilages being one and one-half times heaver; they also extend almost completely around the circumference of the tracheal tube. The rings also are placed more closely together than in the human being, the intervening annular, membranous sections being narrower and slightly thicker. The carina is well developed and the angles at which the right and the left main bronchi are given off are quite the same as in the human subject. The number and direction of the main lobar sub-bronchi vary somewhat from those of the human being.

While the trachea divides at the carina in a dichotonous fashion into a left and a right main bronchus, the extra, superior lobe of the right lung communicates with the trachea by means of an independent bronchus given off about 3 inches (7 cm.) above the carina at the right anterolateral portion of the tracheal lumen. This bronchus offers excellent practice for use of the flexible, 180 degrees, curve-ended forceps and the flexible, curve-ended irrigating or suction tube of Lynah, simulating the right, upper lobe posterior branch bronchus. The lobular branches of the sub-bronchi are more numerous than in the human being.

The texture of the parenchyma is also about the same as in the human lung, as is its histologic structure. The chief morphologic difference lies in the lobar divisions of the right lung: in the human being it consists of three lobes, an upper, middle and lower; in the lamb it is subdivided into four lobes, the upper of which is an adventitous lobe somewhat separated from the one next below, this second lobe corresponding in morphology and topography to the upper lobe of the human right lung. The upper extra lobe of the lamb's right lung lies somewhat superior and internal to the second lobe, is the uppermost of the four lobes, and passes anteriorly to the midline, crossing it and curving in front of the heart. The tubal texture and resiliency are also the same as that of the human lung.

An important and advantageous difference lies in the more highly developed elastic structure of the lamb lungs' subserous pleural mem-

brane, as it allows an easier inflation and deflation of the lungs, and retains this elastic property much longer after removal from the carcass than the human lung does; thus with all these admirable qualities, for the purposes of a substitute manikin for human lungs as well as the ease with which it can be obtained, lamb's lung is the ideal practice material for bronchoscopy.

EXPERIMENTATION

Jackson well states [3] that "no endoscopist has enough practice on the living subject, because the cases are too infrequent and furthermore the tube is inserted for too short a space of time," and that:

> Before attempting the removal of a particular foreign body from a living patient, the anticipated problem should be simulated with a duplicate of the foreign body in a rubber tube. In this way the endoscopist may precede each case with a practical experience equivalent to any number of cases of precisely the same kind of foreign body.

The lamb's lung offers the additional advantage of allowing the placing of a duplicate of the inhaled foreign body in exactly the same location for practice whether in the trachea, main bronchi or their branches, and familiarizes one with the three essentials of endoscopy, namely, approach, manipulation and grasp. There is no real foreign body emergency that cannot be duplicated or afford exact practice with the lamb's lungs. As Jackson [4] says: "It is not only inhuman but impossible to obtain this experience on children." Next to this properly forbidden experimentation on children, the living dog offers the best substitute; but the difficulty as well as expense in securing and caring for living dogs for such experimental endoscopy almost makes the use of this means impossible for physicians outside of medical university centers.

Indeed, with exacting and rigid antivivisection laws, activities of societies for the prevention of cruelty to animals, etc., one hesitates to incur the enmity of, and possible prosecution by, these agencies. In most communities, special licenses for use of living dogs for these purposes are limited to established teaching institutions.

Having all these difficulties to contend with, the use of lamb's lung thus commends itself for bronchoscopic study both to the student and to the specialist. After considerable practice on the lamb's lung, I found that the only factor lacking for making it a perfect substitute for living human or dog subjects was the interesting phenomenon observable in working on living subjects, namely, the dilatation and lengthening of the bronchi during inspiration and their contraction and shortening dur-

3. Footnote 1, page 121.
4. Footnote 1, page 122.

ing expiration. It occurred to me, that with the well-developed elastic membrane of the lamb's lung, it might be possible to construct an apparatus that would allow a mechanical simulation of respiration by inflating the lung to represent inspiration and deflating it to represent expiration. I adapted the foot-bellows (*W*, in accompanying illustration), which was connected by means of a rubber tube attached to a small side branch at the upper end of a metal tube, so made as to tightly grasp with an airtight connection the upper end of the trachea with the larynx removed. By this means, the fresh lamb's lung can be inflated and deflated at will. While working the bellows with one foot, both hands are left free to use the bronchoscope and the various endoscopic instruments as desired or needed for a special problem. The upper end of the metal tube is a separable milled nut, holding a soft rubber diaphragm pierced at the center and through which is passed a specially constructed practice bronchoscope made so it is tightly grasped by the rubber diaphragm, preventing the escape of air from the trachea.

In addition to simulating specific foreign body problems by implanting endoscopically in the various divisions of the lamb's lung, coins, pins, tacks, staples, peanuts and other small articles, this perfect manikin can be used for the practice of suction and irrigation of lung abscess or bronchiectasis as described by Lukens and Moore,[5] endobronchial application of injection of various medicaments (oils, sprays or powder), and also for lung mapping (insufflation of powdered bismuth subcarbonate into various branches of the bronchi), as developed by Clerf,[6] for practicing with Tucker's[7] side grasping pin and tack forceps, for using all the Jackson instruments, and for any other known and feasible endobronchial procedure.

Beyond question, the most difficult bronchoscopic procedure is the removal of inhaled foreign bodies by the means of biplanal fluoroscopy, as practiced by Jackson and Manges. The indications and opportunities for performing this most difficult of procedures are limited and the means at hand still more difficult to obtain. The lamb's lung manikin offers an ideal subject for the practice of this procedure, the roentgenologist and bronchoscopist being thus enabled to work together at such times as they may elect.

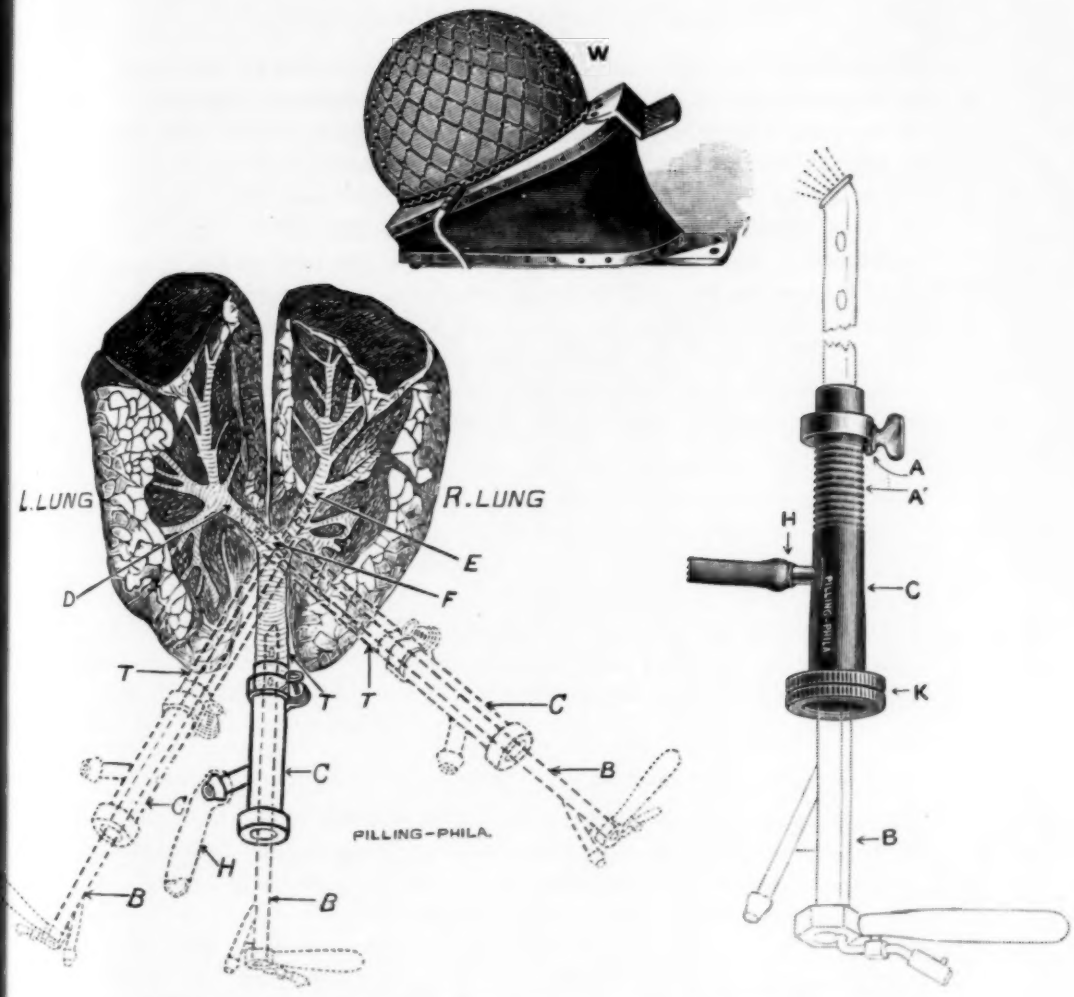
When securing fresh lamb's lung, the person supplying the material should be cautioned that the lungs should be removed with the trachea, bronchi and lungs free from careless cutting of the bronchial tree or

---

5. Moore, Wm. F., and Lukens, Robert M.: Bronchoscopic Drainage of Pulmonary Abscess and Bronchiectasis, Reprint, from the Bronchoscopic Clinic of Jefferson Hospital.

6. Clerf, Louis H.: Bronchoscopic Lung Mapping in Diseases of the Lung, Surg. Clin. N. Am. **4**:104 (Feb.) 1924.

7. Tucker, Gabriel: See Footnote 1, page 35.



Lamb's lung manikin: *A*, collar clamp for compressing outside of trachea, securing it to the bronchoscope holder; *B*, Jackson bronchoscope or esophagoscope; *C*, Mandelbaum bronchoscope holder which enters trachea; *D*, left bronchus of lamb; *E*, right bronchus of lamb; *F*, bifurcation of trachea; *H*, rubber tube connecting bronchoscope holder to the foot bellows; *K*, separable milled nut, holding soft rubber diaphragm; *T*, trachea of lamb; *W*, foot bellows. This provides an easily obtainable model more nearly approaching the living lung for bronchoscopic practice. It may be used for bronchoscopic study as well as for special preliminary practice for proper procedure in actual cases, as advocated by Dr. Chevalier Jackson. (Implanting foreign body similar to that inhaled in corresponding location, for practice before attempting actual removal from patient.) After procuring the natural lamb lung, the larynx is removed from the trachea. Tubular portion *C* is inserted in the trachea with sliding clamp collar *A* fastened over the outside of trachea. The milled nut *K* is separable, allowing the placing of a thin rubber diaphragm. This diaphragm is punctured, through which the bronchoscope passes and prevents the leakage of air. A rubber tube connects the spout *H* with foot bellows. The foot bellows *W* is for inflation, there being just sufficient leakage from the lungs of pumped air to simulate the natural respiration of the patient.

pleural surfaces, as such cuts prevent satisfactory inflation by permitting the escape of air. I personally have the larynx, trachea, lungs, heart and its great vessels, as well as the esophagus and stomach, removed "en masse." This permits a perfect study of the relative positions of these various organs, and acquaints the future endoscopist with their surgical and topographic anatomy as well as with the dangers of unskillful endobronchial manipulations. Before attaching the tube to the upper end of the trachea, it should be evenly cut across, about midway between the larynx and the carina, to correspond to the length of the human trachea. After using, the lamb's lung may be placed in the household icebox without fear of contaminating food; carefully handled, a single lamb's lung manikin, even in hot weather, will serve for a week's study.

ABNORMAL EAR CONDITIONS IN PATIENTS WITH MENTAL DISEASES

G. B. M. FREE, M.D.
Assistant Medical Superintendent, Danville State Hospital
DANVILLE, PA.

In considering the relationship and relative importance of abnormal conditions of the ear occurring in persons suffering from mental disorders or mental defect, we are approaching a field of investigation to which meager consideration has been given in the past. At the present time, when various somatic conditions have been found to be the basis of abnormal mental functioning, in view of the auditory symptoms so often manifested in these patients, we can only conjecture as to what rôle these conditions may play as definite etiologic factors. However, we can observe the varied diseases of the ear which occur as complications or sequelae of abnormal mental conditions. With a view to presenting certain facts and in the hope of stimulating further research along this line, the following observations made on 1,000 patients examined in the wards of the Danville State Hospital over a period of two years are presented.

DISEASES OF THE EAR AS ETIOLOGIC FACTORS IN MENTAL DISEASES

In considering the possibility of abnormal ear conditions as contributing to, being productive of, or being associated with various types of mental diseases, it is not amiss to discuss the various anatomic abnormalities or so-called degenerative stigmas which frequently are seen among patients with mental diseases. From the time of the earliest writers and observers of these patients, the external ear and its anomalies have been well studied, and stigmas of degeneration have been considered by such men as Morel, Stahl, Binder, and perhaps most recently by Schwalbe, as being of definite diagnostic and prognostic importance. Binder has classified these anomalies into twenty-two different groups, and states that such conditions as the Darwin ear, the Morel ear, etc., occurred in 64 per cent. of 354 insane persons under his observation. Knecht found the same types of ear in 20 per cent. of 1,274 criminals.

Recent investigators, however, are inclined to believe, and it would seem deservingly so, that these anomalies, like those of the hard palate, cranial formation, etc., are not of themselves evidences of mental abnormality, and should only be considered significant when occurring with other signs and symptoms. For example, examination of more than 1,000 school children at the mental clinics of the Danville State

Hospital has shown that deformities of the ear occur in a good proportion of children free from all evidence of mental defect. Another of the legacies from ancient mental medicine is the so-called "insane ear" or hematoma auris. As generally understood, the condition consists of a hemorrhage or effusion of blood between the cartilage and the perichondrium, with subsequent enlargement and thickening or a crumpled deformity of the auricle. Earlier writers considered its origin spontaneous and due to trophic changes in the tissues of the insane patient. Some observers attach definite prognostic value to this phenomenon. Savage, in the 1884 edition of his textbook on "Insanity and Allied Neuroses," and other more recent writers state that this condition is frequent in the paretic patient and is due to trophic changes.

After more than twenty years of observation of patients with mental defects in the Danville State Hospital, and after following many thousands of these patients from the time of admission to the date of discharge or death, I am convinced from investigations made in individual patients immediately succeeding the appearance of the condition that hematoma auris, insane ear or cauliflower ear is of neither diagnostic nor prognostic significance. These conditions invariably result from trauma inflicted by the patient himself or by others. When one considers the large number of patients who, because of auditory hallucinations, are given to continual self-mutilation, day after day inflicting injury to the external ear by beating it with their fists in order to drive away the imaginary persons who are talking to them, it is surprising that hematoma auris occurs so seldom. At the present time in a population of 1,715 patients in the Danville State Hospital, only fourteen cases of this condition are to be found.

In the last two cases in the series, the first occurred in a patient as the result of a blow received from a paretic patient; the second occurred in a depressed, resistive and suicidal patient as a result of the necessary pressure applied in holding the head during mechanical feeding with the nasal tube. Savage observed hematoma auris in patients with mental diseases who were "obstinate and refused food." In this type of case, however, hematoma auris is due, not to trophic changes incident to malnutrition and lowered vitality, but to the accidental trauma inflicted to save the patient's life. This fact is further demonstrated by the comparison of former and of present statistics. Kiernan, quoted by Spitzka, reported forty-eight cases in 2,297 patients with mental defects (about 2 per cent.), while in the Danville State Hospital as at the present time, in a population of 1,715, there are (as already stated) only fourteen cases; four in women and ten in men (about 0.8 of 1 per cent.). This reduction unquestionably is not due to a lessening of the trophic changes, but rather to an improved method of humane and scientific treatment.

As to its incidence in paresis, here again the condition occurs in the acutely excited, markedly depressed or suicidal type, not in the ordinary type of the disease. In fact, this condition has seldom been observed among the paretic patients who form 17 per cent. of those admitted to the Danville Hospital; among the fifty-four paretic patients now under treatment in the hospital, there is only one case of hematoma auris, and this, like the cases cited in the foregoing, is due to trauma. Of the fourteen cases, four occurred in depressed manic-depressive patients; five in catatonic dementia praecox patients; one in an excited and resistive defective patient; one in a paretic and three in epileptic patients.

There are, however, certain conditions which may form a definite physical basis for the development of abnormal mental manifestations associated with the ears, and among these may be mentioned impacted cerumen and disease of the middle ear and eustachian tube, with the impairment of hearing incident thereto. In considering the matter of impacted cerumen, we are dealing simply with an exaggeration of a natural physiologic process and one purely mechanical in its action. Nature, in her effort to cleanse, lubricate and protect the auditory canal, provides this secretion, and in the majority of instances it does the work well. There are persons in whom the process becomes pathologic from obstruction, or the cerumen becomes thickened from a mixture with dust and other foreign particles, and then, dry and hard, is incapable of spontaneous discharge. As a result of this mechanical pressure, abnormal stimuli may be conveyed to the auditory center, and, in consequence, sensory disturbances may develop which may even reach the extent of false perceptions in the form of auditory illusions and hallucinations. If this condition continues unrelieved over a prolonged period, hallucinations of the true verbal type, in which the person will hear imaginary voices talking to him, may result. Dr. Pike, clinical director of the Danville State Hospital, reports an interesting case of this type seen at one of the mental health clinics.

REPORT OF CASE

History.—A boy, aged 11 years, showed marked conduct disorders in school, and the teacher considered him feebleminded. His abnormal behavior expressed itself in continued impulsive assaults on his fellow pupils, combined with a lack of attention and muttering to himself. His parents stated that at home he was at times uncontrollable, and was continually fighting with his brothers and sisters without cause. On examination at the clinic, the boy stated that his reason for misbehavior was an attempt to protect himself against the boys who continually called him vile names. He also said that when he was on the street he would hear people behind him curse him, and that when he turned around they were gone. Examination of the boy's ears showed the left external auditory canal filled with cerumen so hard that when touched with a probe it felt and sounded like a stone. Its removal resulted in prompt subsidence of these hallucinations and complete cessation of the boy's bad conduct.

Examination of 1,000 patients, including those of all types and in all stages of mental disease, made as a routine, with no attempt at selection, has revealed that 160, or 1.6 per cent., have suffered in one or both ears from impacted cerumen necessitating mechanical removal. Eighty-seven of this series of 1,000 had both ears impacted: twenty-eight, the right ear and forty-eight the left. The increased frequency in the left ear, nearly double that in the right when but one ear is involved, is undoubtedly due to the lessened dexterity of the left hand in removing the wax in the formative state of impaction.

The frequency of impacted cerumen in insane patients, in a large degree, is due to the diminution and blunting of the pain sense, the formation of the impaction itself often resulting from foreign bodies introduced by the patient and serving as a nucleus for the development of the mass. It is likewise well known that the epileptic patient shows not only intellectual deterioration, but also a general sluggishness and dulling of cutaneous sensibility. It is not surprising, therefore, that this condition has been found more frequently in the epileptic group; in fact, nearly 25 per cent. of the seventy-four female epileptic patients in this group of 1,000 patients showed the condition on first examination, and this group had the largest number of recurrences on reexamination two years later.

CHRONIC DISEASES OF THE TYMPANIC MEMBRANE, MIDDLE EAR AND EUSTACHIAN TUBE

General observation shows that these conditions are not infrequent in the insane, and undoubtedly in many instances are a factor in the production of auditory hallucinations. Psychiatrists have long recognized the fact that the complaint of patients of a snake in the stomach and of electricity applied to a part of the body may be only the expression of definite pathologic change in the abdominal viscera or other part. I recall two such patients in the Danville State Hospital, in whom necropsy revealed duodenal ulceration and death due to perforation. Unquestionably patients complaining of auditory hallucinations may likewise have some abnormal condition of the ear as the foundation of their mental disturbance. We are familiar with the fact that impairment of hearing tends to the development of a suspicious temperament, and the extreme of this, the personality change as seen in the patients with mental defects, is represented by delusions of persecution which are often well fixed and definitely systematized. Shut away to a certain extent from his environment, the individual develops ideas of reference and is prone to attribute the various actions of those about him as having some definite relation to himself. He

cannot hear them, but he thinks they talk about him, and gradually he sees his former friends as his enemies; this condition frequently leads to conduct disorders which demand hospitalization.

In this connection, it may be interesting to note that, not withstanding the relative frequency of the before-mentioned chronic conditions, acute suppurative disease of the middle ear and mastoid involvement necessitating operative procedure on the mastoid are comparatively rare. During the last five years, only one case necessitating operation on the mastoid occurred in this institution.

EAR CONDITIONS AS REACTIVE MANIFESTATIONS IN PATIENTS WITH MENTAL DISEASE

It is well known that patients with mental disease who suffer from auditory hallucinations on which may be engrafted delusions of various type and character, invariably react to those abnormal manifestations by attempting to protect themselves and to do away with their unpleasant experiences. In other words, a patient who suffers from tinnitus, which he may interpret as the chirping of crickets, escaping steam, gases or electricity being forced into his head, or the person who hears imaginary voices which seem to come to him by radio, by electric wires or from people standing outside his room or beneath his window and who continually call him vile names or plot against him, will most naturally attempt to rid himself of the supposed cause of those disturbing and tormenting sounds. Some weeks before his commitment, a patient now in the Danville State Hospital went to the surgeon at the Scranton Hospital and insisted on an opening being made back of his ear to remove the crickets which he claimed were incessantly chirping in his ears. For some years, he continued to request the operation. Examination at the time of admission revealed chronic disease of the middle ear.

The most common approach to the solution of the problem is, as has been noted in the foregoing, in connection with hematoma, the beating of the head and ears to drive away the persecutors, or of filling the auditory canal with all types of foreign material to shut out the sounds. It is interesting to note what has been found in many patients with hallucinations during the routine examination of 1,000. The articles most commonly found are wads of paper, which are inserted in small balls one after the other until the canal is compactly and firmly filled. Bits of rags are almost as common. In one case, I found the canal filled with hair pulled from the patient's head and inserted bits at a time. Another had both ears filled with brown cockroaches. In another patient, a large, well preserved blackbeetle was found. One patient inserts particles of coal in the canal; another, pieces of wood, and others, pieces of softened soap which when hardened become difficult to extract.

CONCLUSIONS

1. Congenital and acquired abnormalities of the external ears are, of themselves, without significance in the diagnosis of mental disease or mental defect, and the latter (hematoma) should be considered as traumatic in origin and without prognostic import.

2. Diseases of the ear should be considered as a definite etiologic factor in the production of certain types of abnormal mental manifestations.

3. The patient with mental defect frequently suffers from ear conditions which are self-produced as a reactive measure to his disturbing mental experiences.

4. Routine examinations of the ear should be made in all patients with mental disease. Such examinations, in many instances, will reveal conditions which if removed will at least render the patient more comfortable, and in some cases will bring about a cessation of the mental symptoms.

PROGRESS IN OTOLARYNGOLOGY

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

TUMORS OF THE NOSE, THROAT AND EAR

A REVIEW OF THE LITERATURE *

GORDON B. NEW, M.D.
ROCHESTER, MINN.

LARYNX

Davis [1] reports a biloculated cyst which was found following the patient's death on the table, before operation was started. The outer portion of the cyst freely communicated with the inner through the thyrohyoid membrane along the superior laryngeal vessels. There was no connection between the saccule or ventricle of the larynx and the cyst. Inside the larynx the cyst was sessile, growing from the inner surface of the right aryepiglottic fold. Davis reports a similar case shown by Mr. Cyril Horsford, in which operation was performed by Mr. Wilfred Trotter. He asserts that this type of cyst can be easily distinguished from the rarer cases of aerocele of the saccule of the larynx, but that extension into the neck cannot always be detected before operation. If the cyst bulges into the pyriform fossa or is of long duration, then it is suspected of being too extensive for intralaryngeal treatment.

Kramer and Yankauer [2] reviewed the literature and reported fourteen new cases of hemangioma of the larynx. They treated all their patients surgically, twelve with indirect laryngoscopy and cutting forceps, and two with suspension laryngoscopy and sharp dissection. They have had no operative hemorrhage. Kramer and Yankauer also report

---

* From the Section on Laryngology, Oral and Plastic, Mayo Clinic.

* This review consists of the more important papers that have been published from October, 1923, to October, 1924, inclusive. It has been impossible to review certain foreign articles and also articles published in this country during the last three months of 1924 on account of the short time allotted for the preparation of this summary. Most of the papers have been reported by simply suggesting their contents; further details may be obtained by consulting the bibliography.

1. Davis, E. D. D.: Cysts of the Larynx, J. Laryngol., Rhinol. & Otol. **38**: 473-476 (Sept.) 1923.

2. Kramer, R., and Yankauer, S.: Hemangioma of the Larynx, Laryngoscope **34**:405-425 (June) 1924; ibid., Lymphangioma of the Larynx. Laryngoscope **34**:621-629 (Aug.) 1924.

two cases of lymphangioma of the larynx, and in reviewing the literature in detail found eight other cases. In two cases the growth had been removed with the cold snare, and in one with the galvanocautery snare. In five others the operation was performed by indirect laryngoscopy. In Kramer and Yankauer's two cases, the tumor was removed with cutting forceps by indirect laryngoscopy. The choice of procedure should be determined by the size of the tumor and the method of attachment. If the growth is small and pedunculated, indirect laryngoscopy and the use of cutting forceps is the method of choice; if large and sessile, suspension laryngoscopy and sharp dissection would be the method of procedure rather than external operative procedure such as laryngofissure.

Opinions vary greatly with regard to the treatment of cancer of the larynx. Most otolaryngologists and the surgeons throughout the country believe that operation is the treatment of choice for malignant diseases of the larynx, while the roentgenologists and radiologists believe that the best results are obtained by treatment with roentgen ray and radium. It would seem with our present knowledge that the laryngeal cancers should be treated surgically, and that the use of radium and roentgen ray should be auxiliary until the results of radiation are better established. The work of MacKenty [3] on cancer of the larynx is outstanding. His results in laryngectomy are superior to any reported in this country. He, however, believes that all intrinsic cancers of the larynx demand laryngectomy, and that thyrotomy and excision of the early malignant tumors should not be done. Many laryngologists would question this opinion. The operation he employs is that which he has described previously, laying great stress on the one-stage operation, with adequate drainage and postoperative treatment. He frees the larynx and trachea under local anesthesia and then uses ether through the large rubber tube after the trachea is cut across. A careful inspection of the growth through an incision into the pharynx, above the thyroid cartilage, would seem to be an improvement as compared with the removal entirely from below, since an inspection of the arytenoid region may now be made and the region avoided if the growth extends to it. The folded catheter drains used laterally in the pockets would seem to be a distinct advantage. The corking of the trachea with a tracheotomy tube wrapped with bismuth petrolatum paste is an improvement in technic. MacKenty's operative mortality is extremely low, being about 2 per cent. His results show that laryngectomy is the treatment of choice for intrinsic cancer of the larynx.

---

3. MacKenty, J. E.: Operative Treatment of Cancer of the Larynx, J. Laryngol., Rhinol. & Otol. **39**:67-78 (Feb.) 1924.

Lewis [4] reports the results of treatment of twenty-one patients who had had laryngectomy for cancer. He advocates the removal surgically of all operable laryngeal cancers with radium and roentgen rays in conjunction. Nine of the patients were treated by a two-stage operation, and eight by a one-stage operation. One patient died one week after operation, from what was thought to be an embolus. One died three weeks after operation; radium seeds had been used at the time of the operation. One died two months after operation following an attempt to dilate a surgical stricture of the esophagus.

Blair [5] reports the results of the treatment of eight patients with cancer of the larynx in which the growth was extrinsic, or was believed to be so. He makes a U-shaped incision, starting external to the angle of the jaw and running down the anterior border of the sternomastoid muscle below the cricoid, crossing the trachea and ascending the other side. This incision permits dissection of the glands of the neck, if necessary. Blair uses the two-stage operation of Crile, suturing the wound loosely, and packing it with iodoform gauze. There were two patients with extralaryngeal involvement who lived six years or more after operation, without a recurrence. One patient had been free from recurrence for more than three years. There had been one death from recurrence and three operative deaths.

Fraser and Watson [6] report the results of treatment of fourteen cases of intrinsic cancer of the larynx. In all cases, thyrotomy was performed. In three cases the thyroid cartilage was removed along with the vocal cord. In three instances the anterior end of the "other cord" was also removed. Their results show that of the fourteen patients, seven recovered and seven died. One patient was alive and well for seven years after the operation, one was well for six years, two patients for four years, two for two years and one patient for one year. One patient died from apoplexy; three patients died from pulmonary complications following operation, and three from a recurrence of the local disease. The authors believe that laryngectomy should have been done in some of the cases in which thyrotomy and excision were performed.

The results of primary roentgen rays and radium treatment are described in an exceptional article by Coutard and Hautant.[7] They

---

4. Lewis, Fielding: Laryngectomy with Results in Seventeen Cases, Ann. Otol., Rhinol. & Laryngol. **33**:359-362 (June) 1924.

5. Blair, V. P.: Radical Operation for Extrinsic Carcinoma of the Larynx, Ann. Otol., Rhinol. & Laryngol. **33**:373-378 (June) 1924.

6. Fraser, J. S., and Watson, D.: Notes on Fourteen Cases of Intrinsic Cancer of the Larynx, with Lantern Demonstration of the Pathological Anatomy, J. Laryngol., Rhinol. & Otol. **39**:79-89 (Feb.) 1924.

7. Coutard, H., and Hautant, A.: Résultats du traitement du cancer du larynx par les rayons X, J. de radiol. et d'électrol. **7**:541-543, 1923.

review a previous paper on the treatment of endolaryngeal epithelioma by roentgen ray, in which they assert that roentgen-ray treatment in the relatively near future will be on a par with operative treatment in surgical cases: "indeed coming nearer than surgery to the therapeutic ideal, which, in the larynx more than in any other organ, should eradicate the lesions, while still preserving anatomic and functional integrity." They point out that opinions vary as to the value of roentgen-ray treatment in cancer of the larynx: some believe that the treatment may yield good results; others, that no benefit is received as all their patients died. German observers feel that roentgen rays are of little value, and that surgical interference is much superior. The authors quote the conclusions of Hofmeister, and especially Jünglung (whose thirteen patients with tumor of the larynx, treated with roentgen rays between 1918 and 1922, all died), that treatment of the larynx should be avoided. They report twelve cases in detail. In the first series of six cases there was one death (17 per cent.) in two years, and in the second series of six cases there were two deaths (33 per cent.). These series, however, include only immediate or recent results of treatment.

Turner [8] reports a metastatic malignant tumor of the larynx, secondary to an adenocarcinoma of the kidney. A thorough review of the literature, along with gross and microscopic studies of the case, are presented.

PHARYNX

Woods [9] has reported quite an unusual lipoma of the retropharynx, in a man, aged 41. The man had not swallowed freely for twenty years and had had to take food in small quantities. His voice had the characteristic twang that is associated with retropharyngeal abscess or tumor. For months his breathing had not been free. The posterior wall of the pharynx was found to be sharply bulged forward at the level of the base of the tongue so as to come into contact with the epiglottis and prevent inspection of the larynx. The tumor could be reached by the forefinger and was quite soft. The article is illustrated by preoperative and postoperative roentgenograms. The tumor was removed, following a tracheotomy through an incision along the anterior border of the sternomastoid muscle. It is described as "bigger than a man's fist, and quite filled a 2 pound jam pot."

---

8. Turner, A. L.: Metastatic Malignant Tumour of the Larynx, Secondary to Adenocarcinoma of the Right Kidney, J. Laryngol., Rhinol. & Otol. **39**:181-194 (April) 1924.

9. Woods, Robert: A Case of Retropharyngeal Lipoma, Brit. M. J. **1**:144-145 (Jan. 26) 1924.

A similar case is reported by Faulder.[10] An oblong lipoma, about 17 cm. in length, was removed through an incision posterior to the sternomastoid muscle.

Morton [11] reports a sublingual fibroma of two and one-half years' duration, which pushed the tongue up against the palate and bulged into the hypopharynx, in a man, aged 39. Following a preliminary tracheotomy, the tumor was removed through the submental region, under general anesthesia. The tumor measured 7.5 by 7.0 by 5.0 cm., and weighed 170 gm. It contained a cystic area. No similar case has been found in the literature.

Lerche [12] reports a patient who had no recurrence for four years after a pharyngotomy for removal of an epithelioma of the hypopharynx. The incision was made along the anterior border of the sternomastoid.

NOSE

Cases of unusual nasal tumors have been reported by Esau,[13] and by Rocher and Anglade.[14] Esau's patient had a median nasal cleft with a dermoid of the septum, and new bone formation in the cartilaginous septum. The tumor was diagnosed by the roentgen rays and microscopic sections. It was removed with a perfect closure. No unusual features were mentioned with regard to the procedure. Rocher and Anglade personally observed five cases, and noted five in the literature, of fibroglioma of the nose. The only danger in removing a nonfluctuating congenital tumor is possible infection of the brain or meninges in case the pedicle has any communication with them. Death occurred from this cause in one patient of the authors' series on whom operation was performed.

NASOPHARYNX

Interesting articles have appeared on the treatment of nasopharyngeal fibromas. Certain authors still hold that the treatment of such tumors should be surgical; others believe that radium or diathermy is the treatment of choice.

Bey [15] reports cases of twenty-eight nasopharyngeal fibromas in which he had operated, with one operative death. None of his patients returned with recurrence. He did not use diathermy or radium but

10. Faulder, T. J.: Retropharyngeal Lipoma, Brit. M. J. **1**:424 (March 8) 1924.

11. Morton, J. J.: Sublingual Fibroma, Ann. Surg. **80**:187-192 (Aug.) 1924.

12. Lerche, William: Carcinoma of the Hypopharynx and Upper End of the Esophagus, Surg. Clin. N. Am. **3**:1203-1209, 1923.

13. Esau, P.: Mediane Nasenspalte bei angeborenem Dermoid, Fortschr. a. d. Geb. d. Röntgenstrahlen **31**:262-263, 1923-1924.

14. Rocher, H. L., and Anglade: Les fibrogliomes de la région nasale, Rev. de Chir. **52**:147-178, 1924.

15. Bey, H. S.: Notes on Nasopharyngeal Fibromata, J. Laryngol., Rhinol. & Otol. **39**:301-304 (June) 1924.

relied on surgical removal alone. He never found it necessary to ligate the carotid or to resort to packing. He reports the fatal case in detail.

Goldsmith [16] reports two cases of fibromas of the nasopharynx which he removed surgically. He gives a complete and detailed report of the literature and of the various methods of treating such tumors. He reports one case of a youth, aged 17, in whom the removal of a fibroma, which almost filled the nasopharynx, was followed by rapid and uneventful recovery. The second case, of a boy, aged 13, resulted fatally after removal of the huge nasopharyngeal growth.

Alonso [17] reports a case of a woman, aged 45, with a fibroma of the nasopharynx. Microscopic examination revealed a typical fibroma. A large tumor filled the entire nasopharynx, pushing the soft palate downward and forward and filling the left nasal fossa, deviating the septum to the right and obstructing the right nostril. An operation (Kocher's method) was performed under general anesthesia, after tracheotomy and ligation of both external carotids. It was very difficult to remove the tumor because of its wide and solid attachment to all the walls of the nasopharynx and the left nasal fossa. There was no bleeding, and the patient recovered uneventfully. Two postoperative radium treatments were given and postoperative granulation tissue was destroyed with the cautery. Three years after operation the patient had had no recurrence and there was practically no facial deformity.

Alonso asserts that fibromas of the nasopharynx in women are rare. In reviewing the literature he finds little distinction as to age; three patients were aged 15 years, and the others were scattered through all decades, including the seventh. He discusses the different methods of operation and believes that the Kocher method is the best one for large fibromas which cannot be removed through the mouth or nose.

New and Figi [18] report the results of the treatment from 1910 to 1923, inclusive, of thirty-two patients with fibromas of the nasopharynx. This group includes only the hard fibromas. Twenty-nine of the patients (90.6 per cent.) were less than 25 years of age at the time of examination, and three (9.3 per cent.) were between 27 and 31. Radium was used by means of a T-shaped lead applicator, radium needles or radium seeds.

From 1910 to 1915, before radium was in common use, eight patients were examined. Of these, five were operated on, with two operative deaths; the other three had simply been examined and could not be

16. Goldsmith, P. G.: Naso-Pharyngeal Fibroma; a Clinical and Pathological Study, J. Laryngol., Rhinol. & Otol. **38**:565-574, 1923.

17. Alonso, J. M.: Contribution à l'étude des fibromes du naso-pharynx chez la femme, Acta oto-laryngol. **6**:45-73, 1924.

18. New, G. B., and Figi, F. A.: Treatment of Fibromas of the Nasopharynx: Report of Thirty-Two Cases, Am. Jour. Roentgenol. **12**:340-342 (Oct.) 1924.

traced. From 1915 to 1923, twenty-four patients were examined after the use of radium became in vogue, and fifteen had been cured. Four of this group could not be traced, but had improved under treatment; one patient was examined only, and the remaining four were still under treatment, having registered in 1923. Eleven (73 per cent.) of the patients cured were between the ages of 13 and 22, while four (26.6 per cent.) were between the ages of 24 and 32.

New and Figi conclude that radium is the treatment of choice for fibromas of the nasopharynx, since it eliminates the usual operative mortality in these cases. In most of the cases the tumor cleared up entirely, and in the others it was held in check during its period of activity.

Shapiro [19] reports the case of a patient, seen in the neurologic service of Bellevue Hospital, illustrating some interesting points in the diagnosis and the neurologic symptoms caused by malignant tumors of the nasopharynx in confirmation of a previous study by New and Woltman.

SINUSES

Johnson [20] reviewed the literature carefully with regard to the treatment of cancer of the antrum. He has discussed particularly the pathologic aspect of such tumors, as described by Ewing, and outlined the treatment given at the Memorial Hospital. Radium was used outside the sinuses and neck, as a preoperative measure. The external carotid, and the lingual and facial arteries were then ligated on the affected side. If any gland involvement was found, a block dissection was done. The operation on the antrum was performed at the first or at the second operation. The growth was exposed wherever the tumor presented, and radium was inserted into it, using, as a rule, from 35 to 40 millicuries for from forty-eight to sixty hours. His results show the value of radium in this type of tumor. In a summary he asserts that conservative surgery combined with radium gives better results than does the radical operation.

ESOPHAGUS

Guisez [21] reviews the symptoms of esophageal cancer, and states that carcinoma is the cause of dysphagia in 50 per cent. of cases. He reports a case of a child, aged 14, suffering from this lesion. He believes that the use of alcohol is partly responsible for the disease.

---

19. Shapiro, L. M.: Some Neurologic Symptoms Caused by Malignant Tumors of the Nasopharynx. A Case Report of the Syndrome of Retroparotid Space, M. Clin. N. Am. **8**:421-426 (July) 1924.

20. Johnson, F. M.: Radium Treatment of Carcinoma of the Antrum, Surg., Gynec. & Obst. **38**:819-822 (June) 1924.

21. Guisez, J.: Malignant Disease of the Esophagus, Brit. M. J. **2**:903-904, 1924.

Twenty per cent. of his patients had paralysis of the left recurrent laryngeal nerve, and several had both nerves affected. Hemorrhage was not an infrequent terminal event. A latent type of tumor, a rapid type and one following a cicatrix are described. In his experience, sarcoma is rare, but very painful when it does occur. Radium was used on 270 patients, thirty-nine of whom lived for more than eighteen months; one patient was living eleven years later. He describes his method of using radium, giving from 100 to 120 mg. of the bromid for ten-hour periods with from five to six applications on alternate days. As a palliative measure, he prefers intubation with rubber tubes to gastrostomy.

Quick [22] believes that treatment of cancer of the esophagus affords palliative relief only. He favors early gastrostomy followed by deep roentgen-ray treatment, and radium intra-esophageally to control ulceration and bleeding.

Souttar [23] describes gastrostomy as a palliative measure for esophageal cancer and recommends the use of flexible wire tubes for permanent intubation of the esophagus.

New and Vinson [24] report two cases of metastasis from symptomless cancer of the esophagus. These cases illustrate how cancer of the esophagus, like other primary lesions around the nose and throat, may be almost symptomless for many months. The extensive metastatic lesion, and not the primary one, may cause the patient to consult a physician.

EAR

Furstenberg [25] reports a case of adenocarcinoma of the middle ear. Among 40,000 admissions to the Department of Otolaryngology of the University of Michigan, there were but two cases of primary malignancy of the middle ear, one a hemangiosarcoma and the other an adenocarcinoma. He states that only one case of primary adenocarcinoma of the middle ear has been reported in the literature, and in it treatment was unsuccessful. He reports a case of a man, aged 67, on whom an operation was performed July 22, 1918, for primary adenocarcinoma of the middle ear. Roentgen-ray treatment was then given. There has been no recurrence in four and one-half years. The microscopic appearance of the tumor is illustrated in detail.

---

22. Quick, Douglas: Some Considerations in the Treatment of Carcinoma of the Esophagus, Am. J. Roentgenol. **11**:383-391 (May) 1924.

23. Souttar, H. S.: A Method of Intubating the Esophagus for Malignant Stricture, Brit. M. J. **1**:782-783 (May 3) 1924.

24. New, G. B., and Vinson, P. P.: Metastasis from Symptomless Cancer of Esophagus, M. J. & Rec. **119**:19 (July 16) 1924.

25. Furstenberg, A. C.: Primary Adenocarcinoma of the Middle Ear and Mastoid, Ann. Otol., Rhinol & Laryngol. **33**:677-689 (Sept.) 1924.

News and Comment

COMING MEETINGS

National Society Meetings

The American Laryngological, Rhinological and Otological Society will hold its annual meeting at Atlantic City, N. J., on May 22 to 25, 1925, inclusive. Dr. W. H. Haskin, New York, President; Dr. R. L. Loughran, 145 West 58th St., New York, Secretary.

Local Society Meetings

PHILADELPHIA: Section on Otology and Laryngology of the College of Physicians of Philadelphia meets on the third Wednesday of each month from October to June, at 8:30 p. m., at the College of Physicians. Chairman, Dr. Fielding O. Lewis; Secretary, Dr. James A. Babbitt, 2117 Chestnut Street.

CLEVELAND: Ophthalmological and Otolaryngological Section of Cleveland Academy of Medicine meets on the fourth Friday of each month at the Winton Hotel. Chairman, Dr. E. W. Garrett; Secretary, Dr. M. Paul Motto, Rose Building.

CHICAGO: Chicago Laryngological and Otological Society meets on the first Monday of the month from October to May at the Crystal Room, Great Northern Hotel. Chairman, Dr. E. H. Norcross; Secretary, Dr. A. A. Hayden, 25 East Washington Street.

MILWAUKEE: Milwaukee Oto-Ophthalmic Society meets on the third Tuesday of the month, at the University Club, at 6:30 p. m. President, Dr. John E. Guy; Sec.-Treas., Dr. John J. Brook, Majestic Building.

CORRECTION

Discussion on Paper of D. N. Husick.—In the ARCHIVES OF OTOLARYNGOLOGY for April, p. 469, appear remarks by Dr. Fetterolf in discussing the paper by Dr. David N. Husick at the meeting of the Section on Otology and Laryngology of the College of Physicians, Philadelphia. Dr. Fetterolf states that the impression conveyed in the discussion that the studies made by Dr. Giddings and himself on infant cadavers "showed that the thymus gland could not be compressed by the trachea" is too broad. The statement published does not properly express the idea advanced by him. The following paragraph, from the article by Fetterolf and Giddings in the *American Journal of Diseases of Children*, **1**:6 (Jan.) 1911, more nearly expresses the correct conception:

"A point that is very noticeable in the hardened gland is that the upper median portion is deeply indented posteriorly by the left innominate vein, which lies immediately on the anterior facies of the trachea. When the size and distensibility of this vessel and the softness and small caliber of the trachea are taken into consideration, we have a possible mechanical explanation of the sudden deaths which occur in the young during anesthesia."

Abstracts from Current Literature

EAR

CONTRIBUTIONS TO THE PHYSIOLOGY OF THE HUMAN VESTIBULAR APPARATUS. SENSATIONS DURING AND SUBSEQUENT TO ROTATION. ERNST WODAK and MAX HENRICH FISCHER, J. Laryngol. & Otol. **40**:201 (March) 1925.

The experiments were carried out on human subjects with the eyes covered. The room was darkened. The object was to determine the sensations during and after rotation.

The authors distinguish between the subjective sensations of movement and the objective movement in space, and they have coined special terms to describe these sensations.

When a person with head erect is turned to the right ten times and suddenly stopped, during rotation he feels that he is turning to the right; when stopped he now has the subjective sensation of rotation to the left, this is the "first negative phase." He feels he comes to rest and after a pause of a few minutes he feels he is again turning to the right, this is the "first positive phase." There is again a pause and he then swings back to the left, the "second negative phase." There is again a pause, and he swings back to the right, the "second positive phase," when he comes to rest finally. This rhythmic change of sensation of rotation takes about fifteen minutes.

The head must be fixed in a head rest, the vertical bar of which is attached to the back of the chair. There are three definite positions of the head corresponding to the position in space necessary to bring each parallel pair of semicircular canals to lie in the horizontal plane, that is, in the "first position" with head erect, the horizontal canals are in the horizontal plane. In the second head position the head is over to the left and forward, to bring the right anterior and left posterior vertical canal into the horizontal plane. The "third head position" is to the right and forward. If rotation is through an arch less than 200 degrees, the first negative phase is absent. During constant rotation, for a period of several minutes, the sensation of rotation disappears, but the body reflexes persist as long as rotation continues (body leaning, etc.). If rotation is carried out with the head not in one of the three positions outlined, the resulting sensations are a combination of the sensations from the canals stimulated.

Purkinge pointed out that sensation of rotation, as the result of circular movement, varies with the position of the head. After ten turns to the right with head erect, the chair is stopped suddenly, there is the sensation of turning to the left. If the head is inclined to the right shoulder, there is a sensation of rotation back and downward in the sagittal plane. The change of the head must be during the first two thirds of the first negative phase, showing that the first negative phase is peripheral in origin, as it is affected by the position of the head. The remaining phases of sensation of rotation are central in origin. From these facts, Purkinge's observation may be restated. The plane of sensation is dependent on the position in space of that particular pair of semicircular canals, through whose stimulation the sensation is caused, and continued as long as there is a stimulation of these canals. If the position of the head is altered, during rotation, similar phenomena occur to those which are seen during the first negative phase.

McNALLY, Montreal.

MENINGOENCEPHALITIC FINDINGS. AS CAUSE OF ACQUIRED DEAF-MUTISM. VERA USPENSKAJA, Ztschr. f. Hals-, Nasen-u. Ohrenh. **9**:506 (Jan. 20) 1925.

Trauma and compression are not of great importance in the etiology of acquired deaf-mutism, but the majority of cases generally occur after infectious diseases, such as epidemic spinal meningitis, scarlet fever, measles and typhoid fever. Uspenskaja did not dwell on those cases which develop by way of otitis media. Concerning the rest, the otiatric literature assumes mainly that they develop in consequence of toxic or inflammatory injury of the endings of the cochlear nerve in the cochlea, respectively, of the ganglion cells pertaining thereto. Alexander, Fischer, Goerke, Nager, Politzer, Scheibe and Steurer have furnished the pathologic-anatomic proofs for this. Steurer could not find changes in the labyrinth in three patients of Goerke and Scheibe, and only a decrease of the ganglion cells in the spiral ganglion. He suggests that a hydrops of the labyrinth was present which could not be demonstrated any longer at the time of investigation. The otiatric literature scarcely mentions that in cases which show negative findings in the middle or inner ear, the primary seat of the disease might be in the intracranial portion of the cochlear nerve or in the central nervous system. Politzer and Mygind describe only one case with changes in a temporal convolution, and Rudinger in the third frontal convolution. The authors do not see therein the cause of deafness. Haike has shown that a labyrinth disease can be secondary to encephalitis in utero. Four contributions by neurologists concern the pathologic-anatomic changes of the meninges and of the central nervous system in acquired deafness. There were changes in the stem of the acoustic nerve and in the primary nucleus of the acoustic nerve in the medulla. Zankla and Brouwer, 1908 and 1909, pointed out secondary degeneration reaching to the midbrain. In 1910, Lewy described a case in which deaf-mutism had occurred after scarlet fever when the patient was 3 years old. The patient died at the age of 65 of tuberculosis of the lungs. Necropsy revealed that an inflammatory process must have taken place in the lateral recess of the fourth ventricle, in the choreoideal plexus, in the cortex of the cerebellum, the cochlear nerve, the ventral nucleus of the acoustic nerve and the acoustic tuberculum. These spots were destroyed. A cyst was also found in the left frontal lobe as a result of the inflammation. Besides these changes, which were without doubt of an encephalitic nature, the temporal bone examined by Haike in serial sections showed a degeneration of Corti's organ and an osseous filling of the basal turn. Following the destruction of the primary acoustic nuclei, secondary degeneration of the paths were found reaching to the corpus geniculatum medium and atrophy of the middle and inner layers of Heschl's gyrus.

These findings, so far as they concern the brain stem, were confirmed by Brouwer and van Walree in 1914, who found the complete degeneration of the cochlear fiber at the entrance into the brain stem, and of the extra medullar portion of the ventral nucleus of the acoustic nerve, and a pronounced atrophy of its oval portion and of the acoustic tubercule. The secondary degenerations also were in accord with the before-mentioned case. In both instances the vestibular nerve was scarcely affected.

The author cites three other cases of acquired deaf-mutism in which meningo-encephalitis must have been the cause; one occurring after typhoid fever, a second after measles and a third after epidemic meningitis.

Case 1.—The patient became deaf after typhoid fever when 12 years old. No encephalitis was reported. The patient had never suffered from dizziness. Total deafness occurred immediately. The examination of the ear (Professor Haike) showed that tuning forks were not heard on either side either by bone or by air conduction. Nystagmus could not be elicited by turning, nor by calorization, but in both instances there was some subjective feeling of vertigo. The patient died at the age of 49, of tuberculosis of the lungs. Necropsy revealed a fresh tubercular meningitis, which was of no interest concerning the deafness. There were large scars of meningo-encephalitis which had taken its course in his youth. They also could be found in the cerebello pontile angle and in the structures of the fourth ventricle. This process, which in all probability was caused by typhoid fever, had destroyed the stem of the acoustic nerve, its ventral nuclei and the tubercula acoustica bilaterally. On the right side the destruction of the dorsal triangular and of Deiters' nuclei were more pronounced. The process also affected the cerebellum.

Case 2.—The patient, a woman, heard until she was 5 years old. She then suffered from measles, and is reported to have had vertigo to the right. Later she did not suffer from dizziness or tinnitus. She learned badly and did not talk. The ear examination revealed that C 64 and C 2,048 were not heard, also no tones of the organ. When hot water was used, the caloric test on the right side showed nystagmus to the right, very little pronounced. Vertigo was present. When cold water was used there was plain nystagmus to the left and upward, but not very pronounced. The duration was of 43 seconds. Vertigo was present. The caloric test on the left side showed, when hot water was used, some nystagmus to the left and upward, but not very pronounced. It was less pronounced on the left side than on the right side. There was no vertigo present. When cold water was used the eyes moved restlessly. There was no real nystagmus and vertigo was not present.

On turning, there was no nystagmus either to the right or to the left, but vertigo and inclination to fall to the right were present. At the age of 35 years, the patient died of cancer of the uterus. The brain stem was cut in serial sections and alternately stained, according to Gieson and Weigert. Microscopic examination showed that the root of the cochlear nerve was totally degenerated on both sides. The ventral nucleus had practically disappeared bilaterally. The tuberculum acusticum was thinned to small strips which contained a larger series of well preserved ganglion cells but only very isolated medullary sheaths. The fibers of Held were scarcely visible. The triangular acoustic nucleus was much narrowed. The vestibularis was strongly affected in its posterior portion. Deiters' nucleus was normal. The adjacent cerebellar flocculus had lost its normal structure and showed a peculiar cicatrization but was not adherent to the brain stem. The extramedullary portion of the acoustic nerve was extensively but not entirely cicatrized. Toward the front the tuberculum acusticum contained single entirely atrophic nerve cells. The ventral nucleus showed, especially in its extramedullary portion, a whole series of well preserved ganglion cells which, however, had lost their typical grapelike arrangement. Immediately laterally of the root of the vestibular nerve was a small, rather round spot, very poor in marrow with comparatively many cells, then followed a thin medullary fiber bundle going dorsolaterally, then a second gray layer with sparse badly stained cells. Laterally, were some medullary fiber bundles again with fibers going partly transversely, partly dorsally. Then followed a narrow zone with better pre-

served ganglion cells. This condition was found bilaterally. The flocculus was also changed on both sides identically. The secondary degenerations were very pronounced. There was no distinct trapezoid body. The medullary fibers stained light. The spot of the upper olive was characterized by a narrow ledge of ganglion cells lying crosswise and transversely. A plain lateral loop was also missing.

Summarizing, the author says that in consequence of measles and then probably in consequence of a middle ear suppuration, degeneration of the stem of the acoustic nerve developed in both parts, especially of the cochlear portion. This led to a grave atrophy of the nucleus ventralis acusticus, of the tuberculum acusticum on both sides and of the secondary paths. What caused the bilateral condition of the flocculus could not be determined.

Case 3.—The patient, a man, became suddenly deaf when 6 years old, after spinal meningitis. He died of tuberculosis when aged 34 years. He did not suffer from vertigo or tinnitus. The examination of the ear revealed that he did not hear C 64 nor C 2,048. When the C 64 tuning fork was placed on the forehead, it was heard 6⅕ seconds on the right side. When the C 64 was placed on the mastoid process it was heard on the right side 8⅕ seconds, on the left side 6⅕ seconds. C 128 was heard 2⅗ seconds on the right side, and 2⅖ seconds on the left side. The Galton whistle was not heard. There was no optic nystagmus present, and no nystagmus on turning or by calorization. When the galvanic current of 5 milliamperes was used, the patient fell toward the anode on both sides. The right drum membrane showed the anterior two-thirds much retracted upward and thickened. The left drum membrane showed a retraction in its anterior upper portion and a slight elevation near the umbo. It was also thickened. The microscopic examination of the brain stem, according to Nissl, among other things showed numerous glia scars of considerable size also at the hilum of the upper olive, in the loop nucleus and in both posterior corpora quadrigemina. The stem of the acoustic nerve, the ventral nuclei, the tubercula acustica, and the adjoining convolutions of the cerebellar flocculus were partly cicatrized, partly melted together. Although in this case the nerve stem was much richer in fibers than in the other two cases, a great degree of hardness of hearing existed. The cause was the extreme destruction of the ventral acoustic nuclei. In the second and third case, the brain showed the reaction in children in which a complete atrophy of the whole system may reach the cortex, the reaction in the patient who became deaf when 12 years old was that of an adult, namely, only those axis cylinders, the cells of which were involved by the inflammatory process became affected. There was no trepassing of the neuron borders. The author admits that Wittmaack's toxic acoustic neuritis may exist in epidemic meningitis and typhoid fever because in both, toxins are created, but she cannot understand why we should think of such an hypothesis which cannot be proved, when we find pathologic-anatomic signs of grave destruction in the meninges, in the nerve and above all in the central nervous system. As proof may be cited the occurrence of defects of intelligence and idiocy in an epidemic of spinal meningitis in which 25 per cent. of the patients became deaf. Among 539 idiots in Norway, 3.7 per cent. became idiots in consequence of spinal meningitis. A primary labyrinthian condition cannot be assumed because deafness in spinal meningitis occurs during the first days. The author hopes that knowledge of these pathologic processes furnishes a direct indication for therapeutic action. In case of progressive hearing disturbance in typhoid

fever, a lumbar puncture should be made for diagnostic purposes, and if the suspicion of meningitis is confirmed, therapeutic lumbar puncture should be done. In epidemic spinal meningitis the antimeningococcus serum should be brought as near as possible to the acoustic nerves by the occipital puncture, which nowadays is generally introduced and is not considered difficult. By the aid of a simultaneous lumbar puncture, a thorough flushing of the lumbar sac should be carried out.

AMBERG, Detroit.

Larynx

CARTILAGINOUS TUMORS OF THE LARYNX (A STUDY OF ALL RECORDED CASES). IRWIN MOORE, J. Laryngol. & Otol. **40**:145 (March) 1925.

No definite conclusions can be drawn as to the etiology of these tumors from a study of the recorded cases. Of the two theories "inflammatory metaplasia of fibrous tissue," or the "developmental theory," the latter is the more probable.

The most frequent sites of the growth are the endolaryngeal surface of the cricoid cartilage, the thyroid cartilage, the epiglottis and the arytenoids in this order of frequency.

The author classifies the recorded cases under the following headings: (1) Ecchondromas or ecchondroses, twenty-eight cases; (2) enchondromas, twenty-eight cases; (3) mixed cartilagenous tumors, eight cases; (4) inflammatory neoplasms, one case; (5) hypertrophy or hyperplasis, five cases. These growths are usually solitary and sessile, presenting an immovable mass. They are most common in males, and are most frequent between the ages of 50 and 60.

The structure of the chondromas in general is that of permanent cartilage and the majority of cases include all types including hyaline, fibrous, and reticulated cartilage. The ecchondromas are the same structure as the cartilage of the larynx; that is, hyaline, and usually start from the deepest layer of the perichondrium. The true enchondromas develop in places where there should not be cartilage. The enchondromas may become cystic or ossified. The mixed cartilaginous tumors are often malignant.

The symptoms are variable, depending on the location of the tumor, its size and rate of growth. Hoarseness is usually the first symptom. Dyspnea may be late and only on exertion. Cough, aphonia and dysphagia may be present in the later stages. On laryngoscopic examination during phonation, the tumor is found subglottic, often extending to the midline of the larynx. If the tumor passes back beyond the upper boundaries of the larynx, toward the pharyngeal space, edema may be present. The diagnosis of chondromas is suggested when an external tumor of the neck is found very hard on palpation, fixed to the larynx and without evidence of inflammation; or if it springs from the posterior cricoid region and has a characteristic resistance on probing. Garel remarks that no other tissue gives this sense of resistance. An absolute diagnosis can always be made by removing a snipping from the growth for microscopic examination. The treatment is operative, and except in the small ecchondroses the method of choice is a preliminary tracheotomy, followed by thyrofissure. There is a summary of the end-results of the sixty-two recorded cases.

MCNALLY, Montreal.

AMYLOID TUMORS OF THE LARYNX. A. BARRAUD, Rev. de laryngol., Paris **1**:1, 1925.

Amyloid tumors of the larynx, as in the mouth, pharynx and nose have been recognized for a long period of time. Reports of their occurrence have been rare, for the reason that they can only be diagnosed by microscopic examination. Such tumors are supposed to occur in certain localities more frequently than in others, but the author points out the fact that they are found more frequently at necropsy, and therefore in such places where complete necropsies are practiced systematically. The tumors are benign in character, of slow development and associated with chronic general infections.

They are never associated with enlarged lymphatics and never form metastases. Cases are cited where such growths were present for years without any symptoms occurring, unless by their size or position they interfered with some function such as embarrassed respiration or phonation. The treatment consists of endolaryngeal operation or radiotherapy, from both of which successful results have been reported.

ROBERTSON, Chicago.

Nose

OBSTRUCTION TO CENTRAL ARTERY OF THE RETINA DURING AN INTRANASAL OPERATION. WILLIAM ZENTMAYER, Am. J. Ophth. **8**:211-213 (March) 1925.

The author reports the case of a youth, aged 18, who was first seen by him a year following an intranasal operation when the right eye became totally blind and remained so for five days. The sight then had gradually improved for about three months, since which time it had remained stationary.

The surgeon who operated, wrote the author that he was doing a right turbinate when the patient complained of failing vision. The operation was immediately stopped and the nose packed. The packing was removed the following day and for five days there was only light perception. When seen by the author the vision in the right eye was 5/15 eccentrically and in the left 5/5 pt. The ophthalmoscope showed clear media in the right eye, disk vertically oval and quite atrophic. The perivascular spaces were well marked, particularly along the superior temporal vessels. Down and in from the disk there was a small area of epithelial absorption in the retina.

The author further reports several cases in the literature where amaurosis followed nasal operations, galvano cauterization of the turbinates, as well as following the introduction of paraffin subcutaneously in the correction of nasal deformities.

The author feels that the fact that the eye affected was on the same side as that on which the intranasal operation was done favors the view that in some manner the route of the embolus is more direct than through the lungs. He feels that the whole problem of embolism is not well understood and until a clear conception of the process can be held, the underlying factor in his case reported cannot be stated with certainty.

CYCLOPLEGIA FROM ACUTE ETHMOIDITIS. ARCHIBALD C. LEWIS, Am. J. Ophth. **8**:224-225 (March) 1925.

Lewis reports the case of a woman who, following a bad cold for three weeks and pain in both eyes for several days, discovered her distant vision had become blurred and she was unable to read.

Examination showed no inflammation of the eyes but the pupils were widely and irregularly dilated with complete absence of pupillary reflexes. The tension was normal. Intra-ocular examination showed that the mediums were clear and eye grounds were normal.

Examination of the nose showed considerable swelling of the middle turbinates and an acute bilateral ethmoiditis. After cleaning and shrinking the nasal chamber, pressure was used and a large amount of mucopus was withdrawn.

Six days after the onset vision became normal and the pupils showed normal reaction.

No eye treatment was employed in this patient, but the nose and nasal sinuses were treated daily for a week. The author feels it is not unusual to see ciliary spasm associated with acute nasal sinusitis, but he believes cycloplegia is exceedingly rare.

A Case of Latent Nasal Accessory Sinus Disease, with Mental and Visual Impairment; Operation; Recovery. E. Watson-Williams, Lancet **2**:1280 (Dec. 20) 1924.

The author reports the case of a man, aged 42, who was first seen in February, 1924, complaining of a discharging left ear. A radical mastoid operation had been performed in 1917 but the cavity had discharged ever since. There was a history of recurrent "catarrh." Nasal sinus disease was suspected but on several inspections no definite evidence was observed.

The following month he complained of feeling very tired and depressed, of being unable to do his work and of failing vision. His wife reported that his manner recently had become "queer" and that his memory was failing.

On inspection, a definite postnasal discharge was seen, mucoid in character. Examination of his vision was right eye 6/12, left eye 6/24. The visual fields were much contracted; no scotoma was present. The Wassermann reaction was negative.

Suction of the nasal sinuses showed thick pus in both antrums, mucus from the right sphenoid and no discharge from the left sphenoid.

For the next two months vision remained about the same. However, the mental condition of the patient again became dull and clouded, and finally, in June, 1924 (after five months of observation), a double intranasal antrostomy was performed. Convalescence was uneventful.

Three months later examination showed his mind to be clear and his memory good; the eyesight perfect except for small print and the patient feels and looks well.

In September, 1924, visual field showed some contraction but much less than in April, 1924. Vision in both eyes was 6/5.

The author feels that the favorable result in this case was probably owing to the operation not having been unduly postponed.

H. H. Vail, Cincinnati.

The Cure of Ozena by Radium. D. I. Vasilia, Arch. Internat. de Laryngol. **4**: 257, 1925.

One of the most complicated conditions of the nose is ozena. Michel considers ozena as an empyema of the ethmoidal cells and sphenoid sinus. Mueller says it is produced by incomplete congenital development of the turbinal mucosa. Pasmantik says it is due to a congenital atrophy of the osseous

system of the turbinals. Grave believes it is developed on scrofulous ground. Della Vedova believes it a trophic neurosis. Delacour says ozena is preceded by a hypertrophic rhinitis and finally following the microbic theory, including a vast number of germs, among which the cocabacillus of Perez occupies a prominent place.

The treatments indicated are as numerous as the theories on the etiology. At first the patients with this condition were treated by antiseptic lavage. In 1893, Watt and Wingram thought ozena was a result of thyroid insufficiency, which view was also held by Luigi in 1920, therefore thyroid gland extract was given to these patients.

Treatments with every imaginable substance have been utilized, with more or less favorable results. In 1919, Benian and Hayton advocated glycerin and glucose in 25 per cent. solution, with the idea of producing a fine culture medium in the nose for the growth of all sorts of pathologic germs, which by their development might produce a most unfavorable condition for the specific microbe of ozena. The results were nil.

In 1902, Lavrand of Lille employed cupric electrolysis in weekly treatments with from 8 to 10 milliampere intensity for ten seconds. A little later, Robert Foy recommended ozone, as this element is absorbed by the red corpuscle which liberates the element in the tissues in three forms: *a*, oxygen in a nascent state; *b*, carbonic acid in excess (which excites the mucosa) and *c*, formic acid which is a muscular tonic.

Some time afterward, Brindel and Mour made use of paraffin injected under the mucous membrane, in an attempt to form an artificial turbinal. In 1922, Ricardo Botey replaced the paraffin by sulphate of barium in vaselin. Caldera reconstructed the turbinals by injection of vaseline following the same principle. Then surgeons suggested narrowing of the nostril by transplanting the inner wall of the maxillary sinus toward the septum and fixing it there.

Autovaccine is one of the recent treatments, but it does not give marked results more than to ameliorate the process during treatment.

The author, realizing the pathologic change in which the mucosa shows an atrophy of the glandular follicles and lymphatics, thought of utilizing radium as an atrophic mucosa excitant. Radium employed in small doses augments the vitality of tissues in contact with it and its use in fetid cancer removes the bad odor. The author used this substance in a few patients and obtained good results. He employed a tube of radium, from 0.50 to 0.70 milligrams, supported in the nose by a tampon arranged on the floor of the nostril, secured by ligatures which passed around the head. The tube was left in place for six or eight hours and the treatment repeated every ten days. At times, the treatment provoked a discharge and sometimes a small amount of blood from the congestion with erosion, which quickly disappeared. After removing the tube, the crusts are detached easily and quickly and the foul odor disappears completely.

A report of four cases is given. The author has more patients who are under treatment and about whom he is ready to report with equally happy results. He says that where it is possible to obtain this treatment, it is the one and only satisfactory means of treating this horrible malady.

GOUNDOU. J. N. ROY, Arch. Internat. de Laryngol., 264, 1925; Rev. de Laryngol. **16**:41, 1925.

Of all the tropical diseases in Africa, goundou is one of the strangest. This condition, the cause of which is as yet unknown, is found on the Ivory Coast

among natives along the river Comoë, and on the Gold Coast where there seems a marked predilection for certain races.

In the author's last voyage of observation of the black continent, twenty-two different colonies were visited, rendering him able to make a more scientific report. Goundou is defined as an acquired disease, characterized by the formation of a bony tumor located on the paranasal region. The tumor, which is generally bilateral, develops on the nasal bone, on the nasal process of the superior maxillary and at times on the lachrymal bone, or on the three bones simultaneously.

The disease manifests itself in early childhood, in the adult, or it may be congenital; it occurs more frequently in the male than in the female, and is also found in monkeys. The condition is also found outside of Africa: in the Malay Peninsula, Sumatra, Oceanic Isles, China, Occidental India, Honduras, Mexico and Brazil, while in one case the condition occurred in a European who had resided in Africa for twelve years. Letulle has shown the skull of a child aged 7 years, found in Peru, which exhibited characteristics of goundou.

Etiology: Mendes had the impression that these paranasal tumors were osteomas, and that in these subjects a central nervous lesion existed which produced vascular changes which caused a nutritive exaggeration in bone and periosteum of the apophyses of the nasal process of the superior maxilla; this is difficult to accept because the tumors are often unilateral and goundou may be generalized. It could not account for the fact that the disease is encountered often in males but not in females and further Strachen reports a case of congenital goundou.

Friedrichsen thought that goundou was a manifestation of syphilis, but against this theory are numerous arguments. Administration of neo-arsphenamin, mercury, iodid of potassium have never cured or even ameliorated the condition in a patient suffering from goundou as most of them never had syphilis.

Friedrichsen found a subject affected with generalized goundou who had syphilis at the same time; thus he evolved the theory without taking the symptomatology of the two conditions into account.

Braddon said it was a disease "sui generis," but this opinion is of little value as it does not account for the symptoms observed and he could not speak of a specific micro-organism.

Macleod believed this disease was due to the presence of larvae of insects in the nasal chambers. This has not been the author's view, because if the insects deposited larvae in the nose a strong local reaction and an abundant secretion would follow, whereas observation of a number of patients with paranasal tumors developed without being preceded by irritation of the pituitary membrane or by pain in the region of the nose; also it would be difficult to occur in patients in whom goundou is generalized and still more in those in whom the condition is congenital. The author has never encountered traces of ulceration cicatrices in the nasal fossae in this disease.

Lim Boon Keng thought that goundou was a congenital malformation, which was due to a defective union between the nasal bones and the superior process of the superior maxilla and frontal bone.

Strachan believed that goundou is an example of a peculiar recurrence in certain natives tribes of Occidental Africa, but since the publication of his work (1894) a considerable number of subjects of apparently different races have been found affected by goundou; further it must not be forgotten

that nearly all of the authors who have studied the structure of these tumors carefully have come to the conclusion that they are recent inflammatory lesions, localized or general.

Nell has said that goundou is always congenital and this investigator is also under the impression that this disease is caused by yaws. This hypothesis is contraindicated by the same, for if goundou was congenital it would not be manifested following yaws, which is a condition that is always acquired.

Recently, Gonzalez reported the case of an infant, Turkish, in whom the condition had been confirmed during the first months after birth, but did not say whether or not the goundou was congenital.

Chalmers, Botreau-Roussel, Clapier and others thought goundou occurred as a sequel of yaws.

With Brumpt, Jeanselme, Nattan-Larrier and Rousseau we believe that yaws have absolutely nothing to do with the etiology of goundou for the following reasons: A considerable number of negroes have suffered from this disease without ever having had the infection of yaws. In other countries subjects having paranasal tumors never had yaws. In countries where yaws made more or less ravages there were no subjects observed with goundou, also more males were affected than females, whereas from yaws both sexes are affected with equal frequency. In Strachan's patient a small congenital tumor developed progressively with the age of the infant.

Roques and Bouffard, Roubeau and Joyeux have observed cases of localized and general goundou in baboons and Macleod and Joyeux have observed the condition in the chimpanzee. We recall that neither of two monkeys inoculated with yaws developed goundou.

Anatomopathology shows that these growths are formed of dense fibrous tissue intermingled with thin osseous lamellae; the fibrous tissue composes about two thirds of the tumor.

Pathologically, it is not an osteoma, not an osseous tumor properly speaking but is an inflammatory neoformation, characterized by chronic spongy osteitis of exuberant variety.

Symptomatology: In the majority of cases and in adults, the tumor is developed spontaneously without pituitary membrane reaction. In other cases the mucosa of the nasal fossae, seems to be the portal of entry or the beginning of the infection, and in these one can always observe rhinitis, sneezing, a mucopurulent or a sanguinolent discharge from the nose and sometimes epistaxis occurs.

To the symptoms may be added headache and localized pain at the latter part of the inflammation, which last for about six months. After a time the discharge ceases and the tumor on one or both sides of the nose begins to appear and develop. In the great majority of cases the tumor is bilateral; many months may elapse between the appearance of the two tumors. At the beginning they are slightly sensitive to touch and lancinating pains have been reported.

The manifest progression is slow and may be influenced by puberty. After some years the growth of the tumor is arrested, although it may progress in size in some cases to a considerable volume and do damage to the eye by pressure or cause a diminution or occlusion of the nasal passages. The tumor never suppurates although it may soften in the center.

Examination of the nostril reveals a nearly normal cavity, the nostril is absolutely permeable and in the African a deviated septum is almost never seen. In the generalized type the short bones affected are usually the scapula,

iliac, vertebra and malar bones; this is by an osteitis resulting in tumor formation more or less large and, so far as the author knows, no bones of the head have been known to be affected by this disease.

The long bones are often affected, the tibia being most frequently subject to either an elongation or an enlargement so it may lose its contour and deform the leg. For the most part the condition is bilateral.

The author gives a report on thirty-one cases observed, of which twenty-five were male and six were female. Two patients were operated on for the removal of paranasal tumor; on the one side the entire tumor was taken away while on the other side a part of the tumor was purposely left to determine whether there would be a recurrence of the growth. There were no recurrences and the patients were successfully treated, resulting in a cure of both subjects operated on. Surgery of the generalized type so far has not been reported, as the author states they are as yet not cured by the aid of surgery.

ROBERTSON, Chicago.

ALTERATIONS OF THE OPTIC NERVE BY LESIONS OF THE NASAL SINUSES. FRANCESCO MEZZATESTA, Riv. Oto-Neuro-Oft. **2**:37-83 (Jan.-Feb.) 1925.

The author reports nine cases of optic nerve changes, of which two showed gumma of the sphenoidal sinus and the remaining seven showed tumors compressing the optic nerve in the region of the optic canal.

In Case 3 of his series, the tumor was an enchondroma of the sphenoid sinus verified by operation.

Case 4 was a fibro-endothelioma, originating from the left maxillary sinus invading the left side of the nose with blindness in the left eye and choked disk. This patient died two days after entrance into the hospital with suppurative meningitis. The author appends a complete necropsy report.

Case 5 was one of neuritis, with incipient stasis by compression at the level of the optic canal from an endothelioma originating from the ethmoid and spreading to the sphenoid. This patient died and an extensive necropsy report is given.

Case 6 was also a case of endothelioma of the ethmoid spreading to the sphenoid.

Case 7 was a tumor of the left superior maxilla which had invaded the antrum and sphenoid.

Case 8 was a sarcoma of the sphenoid, originating from a sarcoma of the left masseter muscle.

Case 9 was a tumor of the sphenoid, propagated from the other sinuses.

The author, in discussing these cases, says that the optic canal, as has been shown many times by many authors, enters into relation with the sphenoid sinus; therefore it is understood how tumors of this cavity by the compression which they exert on the optic nerve can have great importance in causing visual disturbances. The intimate relation between the optic canal and the sphenoid sinus, the variable length of the pathway which the canal, with the nerve compressed in it, runs through the cavity, and the extreme thinness of the bony wall, form the anatomic basis to show the different clinical observations.

The author mentions that the physiologic and pathologic dehiscenses of the walls of the canal and of the sinus permit the mucosa of the sinus to come in immediate contact with the sheath of the nerve, favoring in this manner the propagation of an inflammatory process to the nearby tissues with all

consequences of periostitis, perineuritis, caries and necrosis. The inflammation, which can spread directly into the optic canal and even into the nerve in case of dehiscence or of thin bony wall, can at times be stopped by a thick bony partition.

From Onodi's work it is found that the optic canal can be separated from the sinuses by a wall varying from 1 to 12 mm. in thickness. Therefore serious sinusitis can pass unobserved to cause visual effects.

On the other hand, at necropsy, diseases of the sinuses are often found which were not diagnosed in life and which give the explanation in various cases of amblyopia or amaurosis.

The author feels that many visual disturbances of uncertain diagnosis are in relation to a disease of the sinuses, and that with an accurate observation of nasal symptoms and a corresponding therapy the visual power can be restored. The author mentions that Frankel, in 146 necropsies, found sixty-three cases of sphenoidal sinusitis and Hacke found also the same thing. On the other hand, in patients in whom a disturbance of the sphenoidal sinus was found, not less than 70 per cent. showed blindness, while in the other 30 per cent. the vision was seriously damaged (Van der Hoeve).

The author feels that visual disturbances, due to disease of the nasal sinuses still presents too many gaps. Necropsies have shown traumatic lesions of the optic nerve as a result of trauma of the sphenoid, or strangulation by hyperostosis and relative constriction of the canal, or lesions by direct propagation of inflammation and tumors of the sinuses involving the nerve.

When the sphenoid cavity is inflamed and compression is exerted on the optic canal, a permanent amaurosis which will not improve after any operative intervention results. Therefore, given the differences in the size of the sinus and in the thickness of its walls it must be admitted that an individual predisposition must be present to explain why ordinarily the optic nerve becomes diseased on one side and only in rare cases are both affected.

The author mentions Mendel and DeLapersonne's findings. These authors stated that "in almost half of the cases of unilateral optic neuritis a nasal origin is obviously certain" and that "the optic neuritis is observed rarely in frontal sinusitis, a little more in ethmoid and antrum sinusitis, but is especially the manifestations of an inflammation of the sphenoid sinus, but both nerves can be involved in their canals by double sphenoidal sinusitis." The author gives a fairly extensive bibliography and quotes different authors' opinions.

The author mentions that the first symptom found is enlargement of the blind spot which can often remain for a long time, and may be the only sign of a compression at the level of the optic canal. Later on, a central scotoma may appear and fuse with the blind spot causing an oval scotoma.

The author mentions the work of Markbreiter, who found alterations in the visual field without evidence of ophthalmoscopic changes in 70 per cent. of his cases of sinus disease. The author feels that the cause of the altered function of the optic nerve can be a simple compression or circulatory disturbances or from toxemia or spreading of the inflammatory process to the nerve fibers. It is not clear just which is the chief factor and he feels that all the factors can be present.

The author feels that Leber's and Deutchman's theory that the process in the optic nerve begins with a circumscribed canalicular periostitis is not acceptable, though he feels that from the primary affection of the dural sheath of the nerve and according to the intensity with which it manifests itself,

the central vision can be more or less damaged, since microscopic examination has not always demonstrated the existence of such a periostitis.

The author feels that compression of the entire nerve bundle can explain the peripheral alterations in the visual field, alterations which result from pressure on those portions of the nerve fibers which are influenced, but he does not know how to explain central alterations. Histologic studies of interstitial neuritis of the papillomacular bundle show that the inflammatory focus of the malady is present in the axis of the nerve sheath, and that compression is exerted from the axis toward the periphery and not in the reverse direction.

The author, in explaining central scotomas, says that the macular fibers destined to the function of central vision are frequently the most differentiated of all and at the same time the most delicate, surrounded as they are by a thin sheath and a rich vascular reticulum, they are found in a condition most favorable for nutrition but less favorable for defense, since the blood, chemically altered, which circulates with such richness about them, places them in the condition which most easily comes under harmful action. It is known that a tissue which is more differentiated is more subject to slight alterations and the macular fibers are the most differentiated and they are the ones which are the first to degenerate in the optic nerve, when the medium in which they run is chemically or biologically altered. He feels that since the anatomic conditions determine the stagnation of the lymphatic flow, and this in its turn is loaded with all the toxins which can come from adjacent, inflamed cavities, the circulatory blood of the nutritive vessels of the nerve which are rich toward the axis allows the interchange of fluids to be altered and the central bundle to suffer the consequences.

The author's conclusions are:

1. The intricacy of connection between diseases of the sinuses and visual disturbances is evident. From the anatomic relations which the optic canal assumes with the pneumatic cavities of the face, the sinus which exerts the most harmful action on the nerves is the sphenoidal sinus and sometimes the posterior ethmoid cells. Also the other sinuses which have a greater extension than normal can become intimate with the optic nerve. The canal in general is separated from the sinus by a bony partition and variable thickness, which renders the spread of the lesions from one to the other more or less easy.

2. The visual disturbances which frequently at the beginning do not give any subjective sensations are defects and sectors of the visual field, in central or peripheral scotoma and principally in enlargement of the blind spot. Van der Hoeve's symptom (enlargement of the blind spot) must be detected by the perimeter of large radius such as De Vincentii's which has a radius of 1.20 meters and permits a greater precision. Though Van der Hoeve's symptom is of great importance, roentgen-ray examination is of the greatest importance in showing changes about the sinuses.

3. A bony wall by its thickness can always give a sufficient protection to the optic nerve.

4. For diagnosis, the symptom of Van der Hoeve, with roentgenographic examations and the use of different angles and positions, is important to observe any variations in the projection of the sphenoidal sinus.

5. Early diagnosis is of the greatest importance. Delay is dangerous when there is compression exerted on the nerve fibers.

6. Ophthalmoscopic findings in the lesions of the sinuses can be the most varied; from an absolutely negative finding to neuritis and papillary stasis.

Ophthalmoscopic examination must be aided by other examinations, field of vision, etc.

7. The mechanism of action of the visual disturbances in diseases of the sinuses is ordinarily that of compression. The author says he has never found direct participation of the nerve in the neoplastic process in cases of tumors. Papillary stasis is a mechanical phenomenon of compression and not of infiltration, according to the theory of Schmidt-Rimper.

The author gives thirty-four references to literature.

H. H. Vail, Cincinnati.

Miscellaneous

The Significance of Papilledema to the Neurological Surgeon. Gilbert Horrax, Arch. Ophth. **54**:130-141 (March) 1925.

Horrax analyzed the cases in Dr. Harvey Cushing's neurologic service at the Peter Bent Brigham Hospital, and he found 183 cases during the past ten years (not counting cases of brain tumor, abscess, gumma or tuberculoma) which represented a condition that might cause papilledema. Of these 183 cases, forty-four were termed tumor equivalents, and the great majority of these (thirty-three) had chronic or subacute cisternal arachnoiditis; eight were cases of oxycephaly; three were cases of pachymeningitis hemorrhagica; and of the balance, consisting of 139 patients, fifty-two were cases of sinusitis (all kinds), and of this group, one patient had papilledema; thirty-six were cases of arteriosclerosis, of which four patients had papilledema; twenty-five were cases of encephalitis, of which one had papilledema; nine were cases of tuberculous meningitis, of which three had papilledema; nine were cases of meningo-encephalitis; seven were cases of intracranial aneurysm, of which three had papilledema, and one patient with cerebral thrombosis had papilledema.

Of the total number, thirteen, or 9.4 per cent., patients were said to have shown choking of the disk. The author states that an extremely small percentage of the conditions other than tumor had actually caused papilledema in the series he reports, and he says that in comparison to brain tumors or their surgical equivalents, other conditions causing papilledema are exceedingly infrequent. The nephritis group was omitted from consideration in his series.

Horrax further states that in the last 100 cases of verified brain tumors showing papilledema, forty-eight patients had been treated in one or more ways for choked disk before being referred to a neurologic surgeon. Fifty-eight procedures had been carried out in these forty-eight cases, the most frequent being change of glasses. Of these, five had had tonsils and adenoids removed, and four had had operations on the nose and nasal sinuses.

The author makes a plea for early examination by a neurologist or neurologic surgeon in all cases of choked disk.

Papilledema in Oto-Laryngology. Leon E. White, Arch. Ophth. **54**:142 (March) 1925.

White gives a summary of the extent of papilledema in 176 cases of brain abscess, meningitis and lateral sinus thrombosis, taken from the records of the last thirty years at the Massachusetts Eye and Ear Infirmary.

In two cases of abscess of the frontal lobe, presumably due to nasal sinus disease, the fundi were normal although the spinal fluid was under pressure.

He says this finding agrees with that of Eagleton who, in over 100 cases of frontal lobe abscess, found only three which exhibited definite nerve changes.

Of seventy-five cases of optic nerve involvement due to nasal accessory sinus disease, only three of White's series showed edema of the disks. These were all unilateral.

In last case reported, the patient began to improve spontaneously before spinal puncture or Wassermann test could be done, so that in this case the diagnosis was not absolutely certain.

He feels that swollen disks from disease of the accessory sinuses, teeth or tonsils is an unusual condition, is transitory and is always associated with sudden and marked impairment of vision. He advises no intranasal work until the possibility of brain lesion can be eliminated. He states that the so-called papilledema from infections in the accessory sinuses, teeth or tonsils is not identical with that associated with brain tumor, abscess, meningitis and lateral sinus infections. It would seem advisable to diagnose the edema associated with sinus infections as optic neuritis with edema, and restrict the word "papilledema" to the edema of the optic disks caused by increased intracranial pressure.

The author gives fifteen references to literature of papilledema and otolaryngology.

THE SIGNIFICANCE OF PAPILLEDEMA TO THE OPHTHALMOLOGIST. JAMES BORDLEY, JR., Arch. Ophth. **54**:158-164 (March) 1925.

Bordley states that choked disks are not always the result of tumor growth. They may prove to be the only manifestation of some hidden intracranial disturbance which spontaneously disappears. On account of the possibility that a choked disk due to a tumor might show spontaneous disappearance only to return weeks or months later, he thinks it is unwise to conclude, because a choked disk has diminished in size or disappeared entirely following some small extracranial operation, that the focal infection prompting the operation must be the source of trouble.

The author mentions nasal sinus disease as an instance of focal infection capable of causing choked disk. He says he has seen nasal sinus disease complicated by choking of the disk, but in every instance where the cranial contents were viewed before or after death, unmistakable evidence of intracranial complication existed. He feels that there is an exaggerated importance attached to nasal sinus disease as the cause of choked disk, and that a possible serious consequence on the individual may result from this mistaken notion.

He mentions having studied two patients, one in the service of Dr. S. J. Crowe, and the other a patient operated on by Dr. Walter Dandy, both at the Johns Hopkins Hospital. The first patient applied to Dr. Crowe for operation on the right sphenoidal sinus because he had been told it would restore his sight. The sinus had previously been operated on and was still obviously diseased. Dr. Crowe attributed the choked disks to a probable cerebellar tumor and immediate operation confirmed this view. One year, however, had been wasted waiting for the hoped-for result from the sinus operation, and during that time the patient had permanently lost his sight.

The sinuses of Dr. Dandy's patient had also been extensively operated on. She had a large movable cerebellar tumor, but was so devitalized by the months lost to the ravages of the malady that she barely survived the operation.

Bordley states that possibly in very rare instances sinus disease may lead to an increase in intracranial pressure through a nonpurulent increase in the

fluids of the intradural spaces, such as we see occasionally in disease of the mastoid process, but such a possibility must constitute a very unusual exception.

ABRUPT MONOCULAR BLINDNESS RESULTING IN COMPLETE OPTIC ATROPHY DURING ENCEPHALITIS WITH DOUBLE PAPILLITIS. ROENTGEN RAY OF OPTIC CANALS. CLIFFORD B. WALKER, Arch. Ophth. **54**:165-171 (March) 1925.

The author reports a case of a boy, white, aged 10 years, who four or five days previous to the present illness, nearly drowned while swimming. The present illness began with headache and malaise, followed by nausea and vomiting but with very slight rise in temperature, so that for a week or so the patient was treated for gastro-intestinal upset. In the second week the symptoms were more meningeal; headache had become severe and prostrating. The back and neck became stiff and painful and a tendency to opisthotonos developed. Kernig and Babinski signs were suggestive at the end of the week. Vision in the left eye was noted to be failing rapidly, and when the patient was seen by Dr. Walker, he had a large central scotoma and could barely count fingers. A mild papilledema with elevation of 1 diopter was present on the right side and a more marked condition of the same sort on the left.

There was no nasal discharge. Examination of the nose was normal. The papilledema eventually subsided, leaving vision in the left eye nil and right eye 20/20.

Lumbar puncture gave a yellowish fluid, slightly turbid (slight contamination with blood), pressure 20 cm., cell count of 31 and the differential count showed 80 per cent. lymphocytes; bacteriologic examination was negative.

The subsequent recovery was uneventful except for the rapid blanching of the optic nerve. Walker states that he would have liked to find evidence that this case was an infection primarily of sinus origin with a possible dehiscence or very thin spot in the left canal wall, thus giving more possibility of improving vision by operation or sinus treatment. However, even if it could be considered as sinus infection either primarily or coincidentally, the question of operation in the presence of encephalitis with temperature and possibly meningitis would indeed be serious. On account of the improvement following lumbar puncture and eventual complete recovery except for left optic atrophy, the case corresponds more closely with numerous reports of influenza encephalitis than with the sinus group, in which the measurable elevation in the disk is against the rule.

The author further asks why, in the presence of practically the same degree of optic neuritis and disk elevation in both eyes, one eye should abruptly lose all vision and proceed rapidly to optic atrophy while the other eye showed practically no visual defect throughout.

Walker mentions that the work of Leon White on the size of the optic canal suggested to him there might be a difference in the size of the two optic canals in his case, and, using a similar technic he obtained in his case a projection which showed a round canal on the right of 5 mm., while the left or blind eye showed a flattened canal of 4 by 5 mm., after allowing for the 0.5 mm. enlargement. According to the work of White, 5 mm. is the critical measurement below which visual defects are more apt to occur when the proper conditions exist to produce a swelling of the nerve, and it seemed quite possible that such an explanation might account for the rapid blindness and atrophy in this case.

The author feels that roentgen-ray examination of the optic canals to determine the size and shape might prove of value in prognosis and treatment, not only in nasal sinus disturbance but also in other conditions in which a swelling of the optic nerve might take place, such as in influenza encephalitis.

BLINDNESS FROM TEETH, TONSILS AND ACCESSORY SINUSES. LEON E. WHITE, Boston M. & S. J. **192**:64 (Jan. 8) 1924.

White, reviewing the subject, mentions the anatomic relationships, gives ten references to his own published work and eleven other references.

The author states that over half of the patients give a history of a recent coryza or influenza but that in a few there is no history of infection. Whenever the sinuses are negative, both teeth and tonsils should be suspected. Tonsils at all suspicious, with teeth and sinuses negative, should be removed. He feels that diagnosis many times must be made largely by exclusion. In all cases the patient should undergo thorough physical and neurologic examination. While investigating, time is an important element and it is essential that needless delay is not encountered.

Pituitary disease, brain tumor and multiple sclerosis, while not usually producing such sudden loss of vision, must always be borne in mind.

White speaks of removing the tonsils and opening the posterior sinuses in two patients during the last year, only after they had been thoroughly investigated at the Peter Bent Brigham Hospital and had been discharged from that hospital on the assumption that there was no intracranial condition to account for the loss of vision. These, while not typical cases of accessory sinus blindness, showed sufficient pathologic changes in the nose and throat to warrant making an attempt to benefit their vision by this procedure. They were not benefited and both have since been operated on for tumors above the sella turcica. He says that careful investigation should prevent unnecessary operating.

In reflecting on the pathology of the subject, he considers the following possibilities:

1. Direct extension from the infections in the posterior sinuses to the optic nerve.

2. Toxemia from some infective process. Knowing that retrobulbar and optic neuritis can be caused by alcohol, lead, tobacco, quinin, ethylhydrocuprein, arsenic, syphilis, etc., so that reasoning by analogy there is little doubt but that toxins originating in the accessory nasal sinuses, teeth or tonsils or any part of the body, may have similar action on the optic nerve.

3. Under the heading of bacteremia, Billings has shown that infectious micro-organisms may be carried in the blood stream or by the lymph channels from the foci of infection to the blood vessels in various regions of the body. So there seems little doubt that bacteria may also travel by the lymph channels to the optic nerve.

4. Under the heading of hyperplasia, White feels this is probably of considerable importance and that it undoubtedly renders the accessory sinuses more vulnerable. He feels hyperplasia with infection and direct extension to the optic nerve is probably of far greater consequence than the mere fact that the tissue has become hyperplastic.

5. Under the subject of anaphylaxis he mentions Stark's theory that there is a "sensitization of the tissues of both the sinus and the orbit by the bacterial

proteins, producing an allergy resulting in a localized anaphylactic reaction each time the individual comes in contact with a fresh infection of the same bacteria in the nose, and possibly in other parts of the body." White says that he has had a few cases presenting symptoms similar to those mentioned by Stark. It had not occurred to him that this would satisfactorily explain the pathology but he believes it is a valuable suggestion; he says that as sinus infections frequently cause asthma it is conceivable that they might also produce engorgement surrounding the optic nerve.

In discussing the subject under the heading of prognosis, White feels that the prognosis depends largely on the duration and extent of the loss of vision, the condition of the fundus, the virulence of the infection and the size of the optic canal.

He mentions the work done by Dr. A. S. McMillan and himself at the Harvard Medical School and in the clinics, also the work of Van der Hoeve. He says that, up to the present, with the exception of pituitary cases, he has been able to find in the roentgen-ray plates but little evidence of pathology adjacent to the optic canal. He cannot agree with Van der Hoeve as to the importance of finding purulent sinusitis adjacent to the canal. The important thing to determine is the size and shape of the optic canal. Adjacent pathology is not so easy to determine; many patients undoubtedly require surgical interference where it is not obviously evident.

Whitnall gives the average diameter of the optic canal as from 5 to 6 mm., while Wilbrand and Saenger give the average as high as 7 mm.

The canals were measured in 164 adult skulls, the average diameter being 5.17 mm. The 5.5 and 6 mm. canals were all round and only two had extensive pneumatization about them. Seven of the 164 canals of 5 mm. were slightly oval, four were triangular and only twelve showed extensive pneumatization. Of the 4.5 mm. canals (twenty in number) twelve were oval or flattened at the top and practically all were two-thirds or three-quarters surrounded by pneumatic sinuses. The three canals of 4 mm. were all oval or irregular, two were nearly surrounded by pneumatized sinuses, the third was in a very dense skull and was probably due to hyperostosis.

The canals were usually found to be round, irrespective of the way examined. The top posteriorly was occasionally flattened, and in a few cases the canal appeared distinctly oval with the horizontal diameter usually the larger. Early in the measurements it became apparent that excessive pneumatization of the sphenoid adjacent to the canal was usually associated with diminution in its caliber. The thinness of the bone separating the inner wall of the optic canal from the sphenoid was noticeable in many specimens; in a few, dehiscences were found, but as these might have resulted from cleaning the skulls, it was thought best not to tabulate them.

The size of the optic canal in infants and children is most instructive. The skulls of forty stillborn infants were examined fluoroscopically. Of these it was possible to make out the canal in twenty. In two the canal was oval and in the remainder approximately round. In none was it less than 4.5 mm. in diameter.

Thus it would appear that the diameter of the optic canal at birth is nearly adult size but very short. There is a rather close analogy between it and the annulus tympanicus. The canal seems to reach adult size early in life. Of these canals in skulls from children under 3 years, four were round and two were slightly oval and all approximately were 5 mm. in diameter. The four canals from skulls, aged from 7 to 8 years, were all round and all about

5 mm. Uniformity in the roentgenograms was obtained by having all the work done by one radiologist, Dr. McMillan.

Normal canals were obtained from twenty-five doctors, nurses and attendants. Five of the fifty canals in this normal series were slightly oval. The vertical diameter being 0.5 mm. shorter than the horizontal. The average diameter was 5.35 mm. Twenty-five cases with optic nerve involvement were then filmed; 26 of these canals were oval. This makes 50 per cent. oval as against 10 per cent. in the normal series. The average diameter of the canals of the patients with optic nerve involvement was ⅔ mm. less than the normal series.

The author feels that if future cases substantiate the results in those already studied, it will mean that whenever we are dealing with optic canals of 4 mm., or less the appropriate treatment in a case of severe optic nerve involvement will be the immediate ventilation of the posterior sinuses to prevent atrophy unless some other definite focus can be found. A 4.5 mm. canal does not demand such radical treatment. While in canals of 5 mm. or over, the neuritis is probably not a direct extension from the sinus and recovery from any acute attack may be expected either spontaneously or under local treatment. He feels that when no definite explanation can be found for sudden and persistent loss of vision in a patient with a canal of 4 mm. or less, the operation advocated as a therapeutic measure is the removal of the middle turbinate, a larger opening in the front wall of the sphenoid and the uncapping of the posterior ethmoid cell — a simple and comparatively safe surgical procedure to one at all skilled in intranasal technic.

The author feels that complete ethmoid exenteration, unless the cells are definitely infected, does not seem a justifiable or necessary procedure.

RETROBULBAR NEURITIS. JOHN HERBERT PARSONS, Northwest Med. **24**:4 (Jan.) 1925.

The author states that retrobulbar or retro-ocular neuritis is the term applied to inflammation of the optic nerve behind the eyeball. It is characterized by rapid deterioration of vision with no obvious local cause and especially with no definite ophthalmoscopic signs of disease. The patient complains of rapidly increasing defect in vision in one eye. The central vision is always involved first. Occasionally the other eye succumbs to the same condition after a short or sometimes a long interval; relapses are not uncommon. In many cases pain is experienced on moving the eye. Neuralgia and headache may be present. Ophthalmoscopic examination will probably reveal a perfectly normal fundus.

The author mentions his experimental work done some years ago in tracing the degenerations in the optic nerve resulting from lesions of different parts of the retina in monkeys.

The author feels that the papillo-macular fibers have peculiar vulnerability. In spite of their protected position in the center of the nerve in the middle and posterior parts of its orbital course, they are the first to suffer.

The author feels that a not uncommon cause of retrobulbar neuritis is disseminated sclerosis.

A vast amount of literature has been written on disease of the nasal sinuses as a cause of retrobulbar neuritis, and he says that there is no question about the great proximity of these sinuses especially the sphenoidal sinus to the optic nerve; nor is there any doubt that cases of retrobulbar neuritis do occur as the result of empyema of the nasal sinuses. But he himself feels that this

is a much overrated cause of the disease; for one case in which the relationship is proved there are at least thirty or forty in which the association is purely conjectural. Fortunately the patients usually recover but many of them would have done so without mutilation of the turbinate bone and other painful intranasal operations.

The author speaks of hereditary optic neuritis or Leber's disease. In many cases of typical retrobulbar neuritis it is probable that the nerve is first attacked in the region of the optic foramen. Marcus Gunn drew an analogy between it and peripheral facial paralysis (Bell's palsy), suggesting that the course of each nerve in a bony canal might account for pressure effects. The facts that both are liable to occur after exposure to cold and that retrobulbar neuritis may be preceded by peripheral facial palsy of the same or opposite side, lend some support to the theory.

H. H. Vail, Cincinnati.

Schistoglossus and Double Tongue. David M. Greig, Edinburgh M. J. **32**:1 (Jan.) 1925.

Greig describes a specimen of tongue, removed at necropsy from an infant a few days old, which was characteristic of both schistoglossus or cleft tongue, and of double tongue.

Developmentally, the buccal and the pharyngeal portions of the tongue have a different origin. About the fourth week of intra-uterine life, a protuberance arises on the floor of the pharynx behind the first or mandibular arch. This is supplemented by an outgrowth from the buccal portion of each lateral half of the mandibular arch. These parts fuse to form the buccal portion of the tongue, and as the mandibular division of the trigeminal is the nerve to the mandibular arch, it is the lingual portion of this nerve which supplies the buccal portion of the tongue, and brings along a few fibers from the chorda tympani. It is the failure of these three tubercles to fuse that causes many of the anomalies of this part of the tongue.

The pharyngeal portion of the tongue arises from the fusion of the adjacent ends of the second and the third visceral arches, the foramen cecum forming usually where this mass joins the buccal portion. As the glossopharyngeal is the nerve to the second and the third visceral arches, it supplies the pharyngeal portion of the tongue. The musculature arises from the original geniohyoid and carries with it innervation from the hypoglossal nerve.

The author gives a very clear account of the phylogenesis of the tongue, suggesting an explanation for many of the reported abnormalities. There is a detailed discussion of the cases of deformity of the tongue reported in the literature, with the effect of these deformities on speech deglutition and mastication.

It is impossible to say what determines these abnormalities of fusion of parts, but the author agrees with Keith's view that they are evolutionary wounds, and the failure of the normal growth in the absence of extraneous fetal evidence to the contrary, is a vice of conformation of growth inherent in the organisms.

McNally, Montreal.

Rhinological Complications of the Optic Nerve. Roberto D. Rawson and Esteban Adrogue, Semana méd. **31**:1412 (Dec. 18) 1924.

The authors review the literature, speaking of the works of Berger, Tyrmann, Onodi, Sluder, Wright, Klara and Elschnig.

Reviewing the subject of retrobulbar optic neuritis, the authors mention the anatomic relations and variations, the physiologic pathology of the optic nerve, alterations in the visual field such as central scotoma, paracentral scotoma and peripheral contractions, Van der Hoeve's enlargement of the blind spot.

They mention the importance of differential diagnosis between retrobulbar optic neuritis of nasal origin and multiple sclerosis, and feel that multiple sclerosis is a sickness much less frequently met among their people; they are inclined to think more of the nasal etiology of the ocular condition. They speak of the necessity of using roentgen rays.

In discussing the surgical procedures, the authors state that these can be divided into two categories: the first consisting in penetrating the sphenoidal sinus through the nose, and the second, the more radical procedures that are necessary when one is dealing with tumors. The authors give their technic of surgical procedure. The operations are done under local anesthesia. The middle turbinate is removed and the sphenoid is opened with an appropriate instrument. No packing is used.

H. H. Vail, Cincinnati.

Intracranial Complication After Peritonsillitis. Emil Wessely, Ztschr. f. Hals-, Nasen-u. Ohrenh. **9**:439 (Jan. 20) 1925.

Peritonsillitis is generally considered a harmless disease. In by far the greater number of cases, the condition heals either spontaneously or by intervention, but there are a number of complications which are of vital importance. These occur because the infection is not confined to the pericapsular connective tissue but penetrates into the parapharyngeal space. Extensive deep abscesses are caused thereby. Cellulitis of the parotis media, mediastinitis and abscesses along the spinal column can occur. The cellulitis along the vessels may cause a thrombosis of the veins and of the carotis. The collateral edema may cause edema of the larynx. Little is known concerning the spread of infection toward the cranium. Two patients in Hajek's clinic died of peritonsillitis with endocranial complications.

Case 1.—M. J., a man, aged 51, had suffered since childhood from a yearly attack of tonsillitis and very frequently from peritonsillitis. After a cold contracted eight days previously, violent pain occurred on the left side of the throat. Thirteen days previously he had a swelling of the left side of the face. The mouth could be opened only with difficulty. After the angina, opening the mouth became more difficult. The soft palate was reddened and was protruding on the left side. Fluctuation could not be demonstrated. The hard palate was edematous. November 12, the pain was less, the temperature was normal, the swelling had receded and the trismus had decreased. On account of the ankylosis and the violent pain, a lingering periostitis was diagnosed and a suspicious left molar was extracted. It did not show pathologic changes of any importance. The patient was discharged according to his own wish, but he was told to come daily to the clinic for observation. The patient did not come to Hajek's clinic, but went to Wagner's clinic. Dr. Frischauf reported that the patient was practically without fever. Immediately after his return home toothache set in, which, however, could not be referred to any particular tooth. The upper left premolar roots were removed, without result. The toothache persisted, and neuralgia of all three branches of the trigeminus appeared, especially of the first branch. The attacks set in almost daily, at

the same time, and lasted for several hours. They increased in intensity, and radiated to the first branch on the opposite side; a dull headache appeared. November 29, an abducens paralysis of the left eye set in suddenly. November 30, the patient went to Hajek's clinic; he appeared to be in a dazed condition, had a temperature 101.5 F. and complained mainly of pain in the lower half of the left side of the face. Examination revealed a complete ophthalmoplegia and chemosis on the left side. The swelling of the left half of the soft palate was still present. Professor Hajek made the diagnosis of thrombosis of the cavernous sinus. The blood and spinal fluid Wassermann tests were negative. The roentgen-ray diagnosis (Professor Schueller) was infiltration process (tumor?) of the sphenoid bone.

December 1, Dr. Hofer opened the ethmoid labyrinth radically by the external route. The ethmoidal mucosa was slightly edematous. No sphenoidal cavity was found, and the patient died. Necropsy, performed by Dr. Loeffler, showed an angina phlegmonosa with a consecutive abscess, larger than a walnut, in the pterygoid muscle, a periarticular cellulitis and propagation of the suppuration both to the left and right cavernous sinus (thrombophlebitis purulenta). The sella turcica was filled with pus. The clinoid processes were found to be macerated. The suppuration at this place extended to the base of the brain. The pus contained fusiform rods and streptococci and, in general, the flora of the oral cavity.

Comment.—1. The diagnosis of a cavernous sinus thrombosis was proved to have been correct. 2. The strange symptom of trismus was explained by the suppuration in the pterygoid muscle. It had been attributed to a lingering periostitis on account of the diseased tooth.

Case 2.—J. T., aged 29, was admitted Nov. 3, 1922, with a complaint for 6 days of pain while swallowing. On the day prior to admission, the patient had an incision made while attending the outpatient department. The temperature on admission was 100 F. There were redness and swelling in the region of the left anterior pillar. The left submaxillary glands were swollen and painful. There was a slight infiltration along the sternocleidomastoid muscle, which was tender on pressure. November 4, at noon, suddenly a chill occurred with a temperature of 104 F. Dr. Hofer immediately performed a mediastinotomy, without ligature of the inferior thyroid artery. The vessel sheath of the large vessels of the neck was much inflamed and the tissues were adherent. After the infiltrated glands had been removed the vein appeared yellowish, discolored and empty of blood. In the resected vein, a large septic thrombus was found. At various times a colloidal suspension of silver and Pregel's solution were injected intravenously, also 2 c.c. of vaccine. November 10, the patient died. The clinical diagnosis was sepsis after angina. The necropsy (Dr. Schmidt) showed a severe cellulitis of the left side of the neck with suppurative degeneration of the muscle and vessel sheaths, a swelling and a small abscess formation in both tonsils, especially, however, on the left side. There was a swelling of the left wall of the pharynx with suppurative infiltration of the muscles, also a swelling of the mucous membrane of the left side of the nose and of the left sphenoidal cavity. There was a purulent meningitis on the floor of the left middle cranial fossa and edema of the leptomeninges. An inflammatory cellulitis of the anterior mediastinum was present reaching to the pericardium. On the left side, a pleural empyema was found with a slight compression atelectasis of the left lower lobe. A subacute spleen tumor, parenchymatous degeneration of the liver and of the kidneys, and a slight working hypertrophy of the heart were also present. The

pus contained streptococci in pure culture. In both cases a cerebral complication after an infection of the peritonsillar tissue was found. The following questions came to the author's mind.

1. By which route did the endocranial complication occur?

2. Is the route by which the inflammation traveled always the same?

3. Did the histories offered before, show how to recognize, at an early date, such a propagation and how to present the same?

The route of infection in both cases showed that the tissues between the peritonsillar tissue and the base of the cranium were infiltrated with pus, therefore it must be assumed that a propagation was favored by special spaces in the tissues. Wessely carried on experiments in cadavers by injecting lampblack into the peritonsillar tissue soon after death. From 8 to 20 c.c. of lampblack diluted 1:3 was used. A frontal section was made through the sella turcica, which led through the region of the oval foramen and allowed to draw a conclusion concerning the way by which the lampblack travelled. The experiments showed that when 15 c.c. of lampblack solution was used, invariably the base of the skull was reached. The route was always the same. It led in the parapharyngeal space to the oval foramen. On this route the internal and external pterygoid muscles and the tubal region were more or less infiltrated. This experiment led to the study of the topography of the route of infection.

The muscles of the pharynx are covered on the outside by a tender membrane, the pharyngeal fascia, which becomes very firm toward the base of the skull. Outside of the muscles of the pharynx is a space filled with loose connective tissue, laterally is the parapharyngeal space and backward is the retopharyngeal space. This loose connective tissue continues from the base of the skull to the posterior mediastinum and allows the necessary shifting of the pharynx toward the prevertebral fascia when swallowing. The parapharyngeal space, at the level of the tonsil, is a connective tissue space which is limited as follows, toward the pharynx by the pharyngeal fascia, laterally by the parotid fascia, dorsally by the prevertebral fascia and anteriorly by the lower jaw with the internal pterygoid muscle. Into this space the styloid process penetrates with the three muscle origins, the stylohyoid, the stylopharyngeus and the styloglossus muscles. In the posterior half are found, more or less protected, the internal carotid artery and the internal jugular vein, with the ninth, tenth and twelfth nerves, and the sympathicus. A broad layer of loose tissue leads from the tonsil after passing the thin muscle wall of the constrictor pharyngis to the base of the skull. In this layer, the trigeminus is the guiding line. This loose connective tissue of the anterior parapharyngeal space is endowed with a venous plexus rich in meshes. As plexus pterygoideus it surrounds especially the external pterygoideal muscle and the trigeminus nerve and it stands in direct communication with the circellus venosus of the foramen ovale, and this leads directly into the cavernous sinus. Therefore,Wessely found a direct communication of the venous vessels between the tonsils, the base of the cranium and the middle cranial fossa.

There are three possibilities of an infection from the tonsils to the middle cranial fossa: 1. By way of the loose connective tissue of the parapharyngeal space. 2. By way of the venous net described in the foregoing. The velocity of the current is probably very small and retrograde sometimes. 3. By the combination of both ways. The end-result of such an infection, no matter how it starts, is always a purulent thrombophlebitis of the cavernous sinus.

Under ordinary circumstances the muscle wall of the pharynx forms a barrier which, as a rule, offers more resistance than the peritonsillar tissue. It is probable, but not proved, that the existence of scar tissue, in consequence of former attacks of cellulitis, furnishes a greater resistance than the muscles of the pharynx. Wessely quotes seven additional cases from the literature.

CASE 3.—The first published case of a pharyngitis phlegmonosa acuta complicated by suppurative meningitis (Stanislaus and Stein: Monatschr. f. Ohrenh. **10**:313, 1894).

CASE 4.—Angina, and pharyngitis phlegmonosa with suppurative thrombosis of the cavernous sinus and purulent basilar meningitis (Tollens, C.: Ztschr. f. Ohrenh. **44**:3, 1903).

CASE 5.—Phlegmon periamygdalien mortel par thrombophebite du sinus cavernaux (Jacques et Lucien: Nancy, 1908).

CASE 6.—A case of brain abscess from a tonsillar abscess (Kandler, R.: Dissertation, Munich, 1907).

CASE 7.—Rare complications of a tonsillar abscess (Berl. Klin. Wchnschr. **26**:1241, 1914).

CASE 8.—Peritonsillar abscess, followed by osteomyelitis necrosing encephalitis and meningitis (Wylie, Andrew and Wingrave, Wyatt: Lancet **1**: [Feb.] 1919).

CASE 9.—A case of thrombosis of the cavernous sinus following a peritonsillar abscess, reported by Hoeston, at the meeting of the Otolaryngological Society in Christiana, Feb. 26, 1920.

CASE 10.—Suppurative meningitis extradural abscess in the posterior cranial fossa after purulent tonsillitis (Beck, O.: Vienna, Td. German Otol. Soc., 1914).

Wessely draws the conclusions that there is no absolutely reliable symptom which permits us to diagnose the endocranial complication in time. Prevention of this complication is only possible by timely conquering of the peritonsillar abscess by: (*a*) evacuation of pus, (*b*) extensive tissue relaxation and (*c*) sparing of the lateral pharynx wall. Because of the virulence of the microbe the peritonsillar abscess must be opened in such manner that the wall of the pharynx is not injured, and that the parapharyngeal wall is not opened and infected. Special care is necessary when there is no fluctuation. In such cases the upper pole must be lifted, or the tonsil must be separated from the palate at the spot of the collateral edema. According to the seat of the abscess each patient must be treated individually, which fact has been known for a long time. In view of the fact that it is difficult to approach the parapharyngeal space even after a complete tonsillectomy, the upper portion of the vessel sheath and the connective tissue space behind the parotis must be freely exposed by the pharyngotomia lateralis in order to drain this space from inward and outward.

AMBERG, Detroit.

Society Transactions

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Regular Monthly Meeting, Feb. 2, 1925

E. P. Norcross, M.D., *President, in the Chair*

Speech Complications. Presented by Dr. Austin A. Hayden.

This patient had worn a velum obturator for a number of years. When she was about 3 years old, she was brought to Dr. Gunn, who advised that nothing should be done until she was older. When the patient was about 19, she secured a soft rubber obturator or velum and wore it for about fifteen years, having it changed every year or two. There were certain objections to this. After wearing it for a while the food tasted of rubber and the patient thought she could detect the odor of old rubber. Food would lodge beneath it, and it would have to come out and be cleaned. About five years ago, Dr. Case made the hard rubber obturator which she still wore, and which has been so comfortable that she is not conscious of wearing it. The patient had a mold by which another obturator could be made whenever necessary.

Dr. Otto J. Stein presented an infant with a marked palatal defect.

DISCUSSION

Dr. Frank G. Bruner, Director of Special Schools, Board of Education (by invitation) said that speech defects more than any other handicap, except, perhaps, blindness and deafness, interfere with the child's progress in his school work and with his success in life, primarily because of a feeling of inferiority. It has been their experience that many of the children with speech defects in the public schools admit failure and say they cannot participate in a recitation rather than acknowledge their inability to speak.

Dr Bruner referred to a boy with a high pitched voice who refused to recite because he did not wish others to hear his voice. After some instruction in speech correction, this boy became one of the honor students in his classes and a member of the debating team. Dr. Bruner has known many adults with speech defects who had developed an inferiority complex and were failures, who, after the correction of the speech defect, became aggressive and successful in their work. It is difficult for people with speech defects to find employment and there are some lines of work in which they cannot engage. Hence the extreme importance of speech correction work and, obviously, the earlier the work is begun the better.

At present in the Chicago public schools there are thirteen teachers engaged in the correction of speech defects who go about from school to school giving their treatments. They use the psychologic mode of approach. They are not laryngologists or psychologists but teachers, and therefore in some cases require the assistance of laryngologists and psychiatrists for expert advice. Very largely they employ the individual method, which has been found much more successful in their hands than the group method. The method consists

of relaxation, breathing, tongue and vocal exercises of one kind and another, the aim being to develop poise and unselfconsciousness. They use somewhat the same exercises for stuttering as for defects due to other causes, with such modifications as each individual case may require.

Last year, the teachers worked in 207 schools and treated 2,300 children. They were able to see each child for only ten or fifteen minutes at a time; some were seen twice a week but most of them only once. Children are given exercises to practice by these special teachers and the results are checked up at the end of a week.

They classify speech defects as major or minor. Minor defects are those which are purely matters of habit. Major defects are constitutional. Many children have defects of articulation who can speak correctly if their attention is called to it. Of the 2,300 children treated, some for one year and some for two years, the teachers were able to dismiss 1,200 as cured, and to show marked improvement in the speech of 800 more. They brought about either cure or improvement in 70 per cent. of all major cases treated, and in 88 per cent. of all minor cases.

Their relations with laryngologists are not so close as they should be, because as a rule laryngologists are not particularly interested in speech defects, and also perhaps because of the failure of the schools to call on them for help as frequently as they should.

Dr. Bruner expressed a desire for closer cooperation and a belief that it would be mutually beneficial.

SPEECH COMPLICATIONS OF INADEQUATE PALATES (WITH EXHIBITION OF PATIENTS). Presented by DR. ELMER L. KENYON.

An adequate palate, from the speech standpoint, is one that is capable of completely closing the pharyngeal-nasopharyngeal isthmus for speech purposes. This closure may be accomplished (1) entirely by the palatal structure and by the palatal musculature; or (2), by the palatal structures (usually physiologically impaired), plus the assistance of the superior constrictor muscles. An inadequate palate is one that is incapable of completely shutting off the nasopharyngeal isthmus for speech purposes.

Little has been written and little is known concerning the origin of the congenital short palate. By the ordinary examination, this sort of palate usually appears normal. Only on close analytic study it is realized as inadequate to close completely the palatal isthmus. An adequate soft palate must measure considerably longer between the posterior border of the hard palate and the lower edge of the soft palate, than between the posterior border of the hard palate and the pharyngeal wall. It has been maintained that, if the soft palate be inadequate, its lack is due to deficiency not in the velum, but in the hard palate. Substantiating this assumption, one finds in certain cases of congenital short palate a central indentation, or defect, pointing forward, in the posterior border of the hard palate. This is apparently a miniature of the larger defects of like character found in cleft palates. Such a defect was present in Case 1. On the other hand, this defect sign in the hard palate is not always clearly present in congenital short palates as was shown in Case 2. At present, Dr. Kenyon is inclined to consider the shortness of congenital short palate as due in certain cases merely to Nature's skimping in supplying sufficient length of tissue for this structure.

CASE 1.—N. E. T., a youth, white, aged 17, in his third high school year. As a whole, the palate appears normal. The distance from the lower border of

the soft palate to the posterior pharyngeal wall seems unusually large to the eye. The distance of the posterior border of the hard palate to the pharyngeal wall is greater than the distance to the posterior border of the soft palate by 0.02 inch. A small indentation points anteriorly in the posterior border of the hard palate.

CASE 2.—E. N., a girl, white, aged 15, 6th grade in school, has not been regular in school attendance. The patient is of fair mentality and of excellent character. In general, the appearance of the palate is normal. The border of the soft palate is far removed from the posterior wall. The posterior edge of the hard palate is rough, but is not clearly indented. It makes a normal effort to move on phonation. It is scarcely possible to force the soft palate to the posterior wall by careful instrumental pressure upward and backward.

CASE 3.—L. K., a boy, white, aged 13, of good mentality and character. His palate and speech were normal up to the age of 3, when the voice became nasal following a severe infective sickness. The palate is well formed and anatomically on testing seems nearly or quite sufficient, although some stretching possibly was employed. On phonation, the movement of the right side of the palate lags behind the left, and the palate does not completely reach the posterior wall.

From the speech standpoint, the congenitally short, and similarly impaired palates are more dangerous than cleft palates. This is because the cleft palate is understood and is known to require special operative as well as speech attention, while the other types, not being understood, are allowed to drift indefinitely. Such had been the fact in the foregoing cases. Each of the patients suffered from three distinct types of speech disorder: (1) open nasality; (2) disordered articulation, and (3) abnormally high pitch and monotony of voice.

In addition, the first patient stammered at times. The third patient had largely recovered from articulative defects, which in Patients 1 and 2 were so severe as to render the speech in large part not understandable.

The disturbance in the psychology, on which disordered articulation depends in patients with inadequate palates, was explained as was also the manner of training of the voice and speech in such patients.

While many patients with cleft palate, through operative correction, assisted by speech training, obtain excellent speech, the situation in general, from the speech standpoint, of all patients with inadequate palates is far from satisfactory. If speech training was instituted early in the speech development period, and persisted in, much improvement would be made. Also if it were possible, through training, to call at will on the superior constrictor muscles to aid the impaired palate to accomplish complete functioning for speech purposes, the situation would be vastly improved. Individual patients do accomplish this. The speaker for some time had been endeavoring to find a method for accomplishing this important advance step in training methods.

CASE 4.—A girl, aged 5 years, whose palatal inadequacy was due to complete palatal cleft with double harelip, had been operated on several times by Dr. F. B. Moorehead, with excellent functional result.

CASE 5.—A girl, aged 7, in whom extreme nasality had immediately followed tonsillectomy at 5 years. The speaker strongly suspected the original existence of congenitally short palate in this patient. The tendency of physicians, as indicated by the history of these cases, to perform the tonsil-adenoid operation indiscriminately in order to improve disorders of speech, he considered

an indication of a lack of operative intelligence with respect to speech conditions.

DISCUSSION

DR. W. H. G. LOGAN (by invitation) confined his discussion to the indications for the surgical and mechanical correction of congenital cleft palate. He agreed with Dr. Kenyon that there were many important phases of the subject which should make particular appeal to all physicians called on to deal with diseases and abnormalities of the nose, lips, palate and throat. His discussion was illustrated with slides, the first of which demonstrated the importance of not cutting all or any part of the fibers of the muscles of the palate to any degree that would interfere with the future normal function of these tissues.

Although Dr. Logan presented a single technic for the surgical correction of congenital cleft palate and lip, he did not contend that other methods would not produce satisfactory results, providing (1) that the method followed avoided making such incisions as would destroy or reduce the function of the important muscles of the palate as they are called on in the various movements of speech; (2) that the operative procedure followed avoided, so far as it is possible, any unnecessary shortening of the palate; (3) that the method adopted definitely reduced the distance between the borders of the bone cleft directly in from the tuberosities in those cases where the cleft is extremely wide; (4) when the cleft palate extends completely through the hard palate and the maxillary ridge, the surgical correction reestablishes the maxillary ridge and the floor of the nasal fossa, at least in its anterior part, and (5) if the cleft in the lip is complete, the correction should be of such a nature as to permit the repaired lip to function relatively normally, and both in appearance and thickness to be symmetrical with the tissues beneath the nostril on the normal side.

One slide was used to illustrate the point that many children having normal palates but defective lips speak imperfectly, as some of these cannot say "boy," "Peter," "bat," "Papa," "Mamma," "lip," "back," unless they have lips that meet normally. Unless the maxillary ridge is properly formed so that the teeth may erupt relatively normally, or may thereafter be normally supplied, these patients will be unable to properly articulate such words as "vain," "vanity," "front," "fast," "farthest."

In closing his discussion, Dr. Logan summarized the sequence with which these operations should be performd on infants, as follows:

An infant born with congenital cleft of lip but having a normal maxillary process which may or may not be complicated with cleft to any degree of the soft and hard palate, posterior to the normal anterior maxillary process, should not have the lip deformity corrected until it has ceased to nurse, unless the surgeon is positive that the mother's milk may be maintained throughout the entire postoperative treatment.

In cases where there is a normal maxillary process, as described, and the infant is not receiving its nourishment by nursing, the operation on the lip need only be postponed until a proved formula has been found, the birth weight of the child regained and a satisfactory physical condition is established.

Patients presenting with complete congenital cleft of the hard palate, maxillary process and lip, should have the defect in the maxillary process closed first. (The only exception made to this statement is in those cases in which there is such a marked deficiency in the bony parts, that to bring them

into contact would occlude the nasal fossa on that side and produce a deformed upper arch.)

To avoid undue surgical shock, it is held to be advisable in the majority of these complicated cases, not to operate on the complete cleft of the lip until from four to eight weeks after the operation for closure of the cleft through the maxillary process, and a narrowing of the width of the cleft straight in from the tuberosities.

If the case is complicated with protruding premaxillary bones, they should never be excised, but always retained and placed in position to be made an integral part of the jaw, as they contain, as a rule, the germs of the upper deciduous and permanent incisors and form a necessary support to the upper lip.

When separated bones are brought into position, the compact surface is removed so that a bony union may be secured in the line of the maxillary ridge.

A good percentage of cleft palate cases should have mechanical rather than surgical procedure to close the cleft.

Most cleft palate children should receive voice training after the surgical correction of the defect, even though the congenital defect in its entirety has been completely united.

Dr. Meyer Solomon (by invitation) said that so far as the strictly organic neurologic aspect of this subject was concerned, there was nothing to say, but the functional results, such as nasality, high pitch and disturbances in articulation, were important from the broader neuropsychiatric point of view, meaning by this the personality reactions of the individual to the situation, which in this case was the palatal defect with its accompanying speech defect.

The palatal defect and the speech disorder directly resulting therefrom may produce certain mental reactions, which, in their turn, are responsible for certain disorders in speech, a circular process resulting. The speech disorders associated with palatal defects may be due to the latter either directly, by the mechanical malformation, or indirectly, by nervous and mental habits and attitudes.

In meeting any obstacle or handicap in life, we instinctively adopt one of two main methods: flight or fight. In adjustment by flight there are varying degrees of selfabasement, such as shame and embarrassment, self-consciousness, fears, overtimidity, feelings of inferiority, incapacity, insecurity, helplessness, ideas of self-depreciation and self-accusation, shyness, etc. Occasionally the *eingeschlossen* or shut-in tendency occurs, with selfisolation, overrepression, inaccessibility and uncommunicativeness. These varying degrees of repression of the personality arise from mental conflicts centered, in these patients, about the palatal defect with its concomitant speech disorders.

Adjustment by fight may be blind or directed. When blind, it is uncritical and extreme, with overassertion and overcorrection, so that the child may be overproud, overbold, jealous, etc., or truancy and delinquency may occur; or there is excessive interest in speech, or unduly slow speech, or talking too much, and similar reactions. When adjustment by fight is directed, there is resort to compromise, with the adoption of a common sense method in which the child accepts the situation calmly and quietly, and with determination and a directed technic, endeavors gradually to improve his speech without overassertion or selfabasement. For this the patient needs careful guidance.

The possible speech reactions in these cases may conveniently be classified as follows: 1. Imperfect speech, caused directly by malformations of the speech organs. 2. Voice defects after operations performed on these patients,

whether adenectomy or otherwise. In both conditions just mentioned, especially in mild and borderline types, it is often difficult to determine just how much is really due to the mechanical defect and how much to the habits and attitudes. In both cases one must retrain speech and correct false mental attitudes. 3. Sluggish enunciation due to poor muscular coordination, some of which may be physiologic but much of which is psychologic. 4. Retarded speech due to lack of incentive, attention or effort, dependent on feelings of inferiority. 5. Infantile substitutions not caused by the palatal defect but by errors carried over from early childhood to later years. 6. Voice defects not organic but merely reflecting the mental states. 7. The definitely nervous speech disorders labelled nervous hesitation, cluttering, stuttering and stammering.

Patients with the first two conditions may have one or more of the other speech defects, these being but superimpositions which can be prevented and cured only from the neuropsychiatric approach, with speech training. Many of these patients need careful personality study or mental analysis, of the common sense and not phantastic sort, to give them nervous and mental balance and a proper philosophic attitude toward the situation. This is especially important in early childhood and at puberty. The cooperation of the parents is essential.

Dr. Solomon believed that if anything definite or positive can be done by mechanical methods or surgery to correct the mechanical defect, it should be done. Speech training and exercises are indicated to improve the technic of speech. Often what is more necessary than mere technic of speech is calmness, poise, living in what one says and taking time to say it, with clear enunciation. The nervous and mental aspects and complications in each case must be looked for, recognized and eliminated.

Dr. Loren D. Sayre (by invitation) said that his side of the subject was the prosthetic correction of palates, whether congenitally abnormal or otherwise. He paid tribute to the work of the oral surgeons, and believed that the proper correction of cleft palates is usually surgical. In the patients presented by Dr. Kenyon there was nothing that Dr. Sayre could have accomplished from a prosthetic standpoint. The cases due to accident or to congenital shortening of the entire cleft because of failure of union of the hard and soft palates present a difficult proposition. Many of the patients that come to his attention have been operated on anywhere from one to twelve or fourteen times, many of them by men who never should operate in this class of cases. They can accomplish much more with a wide open cleft than with one which has been improperly operated on. Three men in dentistry have done outstanding work in these cases. The first was Kingsley, the next Case of Chicago, and another man who is now doing a great deal of this work is Tapany in Zurich. In many of the palates that Dr. Sayre has constructed there has been improvement but some are not brilliant successes. In two or three instances the patient can speak distinctly and in others not so well. He was convinced that the difference has not been due to the appliance that has been used, but to the temperament of the patient. Either they have not the desire, the ambition or the pride to go to all the trouble that is necessary for them to improve or to correct their speech, or there is an inability on their part to do this. The operators cannot take all the responsibility if they make it possible, so far as they can, for the muscles to develop.

The first appliance is usually made of velum rubber. The tissues take more kindly to this soft material than to any other; after it has been in place for two or more years a hard rubber or a metal appliance can be

inserted. The metal appliance is probably the best thing that can be used so far as resonance of the voice is concerned. The tissues around these appliances develop, depending on how much the patient uses the muscles, and each successive appliance can be made smaller. Patients frequently improve a great deal after the appliance is removed. The obturators and the velums which are made in one piece are the most successful, but few men have been able to construct them. The majority of these appliances are made in conjunction with teeth, and in this way missing teeth can be reconstructed. They get the best results in this work with patients aged between 15 and 25. After that, patients seldom care to go to the trouble of correcting their speech, for they have acquired habits and methods of living and making themselves understood and are satisfied to go on as they are. Success occurs in direct comparison with the mentality of the patient.

Dr. D. P. Macmillan, Superintendent of Public Schools (by invitation), emphasized the desirability of making a thorough mental and physical examination of every patient. In so many instances it is found that in the nonorganic defects the speech defect is symptomatic of a general disorder, a constitutional neurotic defect evidencing itself in the speech disorder. It may likewise be indicative of a receptive defect, which touches the otologists.

The key to success in this work is that attention should be directed to the receiving and only incidentally to the expression, reversing the whole process as it is emphasized now, not only to secure composure, but reeducation to secure impressions and also the reflex of expression.

Dr. Robert Sonnenschein thought that, of the many valuable points which had been brought out, nothing was more valuable than that of lengthening the palate.

He asked what Dr. Kenyon thought of the procedure which he saw in Berlin in 1909, by Ekstein, who injected hard paraffin under the posterior wall of the pharynx at the places where one would expect the apposition of the palate and the wall, and claimed to get excellent results in producing this apposition.

Dr. Sonnenschein also asked Dr. Kenyon's opinion about the removal of adenoids, and stated that in many instances the speech had been made worse by adenoidectomy where a rhinolalia aperta was present.

Dr. Joseph C. Beck thought that some of those present would remember that fifteen years ago he presented a patient with a congenitally short palate, in whom he injected paraffin retropharyngeally. The girl was kept at the dispensary for the benefit of students who wished to examine the postnasal spaces. She could not close the posterior space so she was a good subject. He had the woman make a record of her speech on a phonograph disk. She thought that she spoke like everyone else and when she heard the reproduction of her speech on the record, she collapsed. Dr. Beck injected hard paraffin in a line where it would meet the soft palate in speech and it made a marked improvement. In order that he could watch the patient he placed her in the employ of their hospital and kept her there for five years. Within six months the paraffin sagged and an additional injection had to be made on top of it, and then he had to remove the whole thing because the patient had gagging sensations.

He asked whether Dr. Kenyon would consider an external operation through the neck, exposing the anterior common ligament and implanting a piece of ivory which would produce a projection there, as a worth while procedure.

He also asked whether Dr. Kenyon used the nasopharyngoscope to demonstrate the things that are going on there during phonation.

Dr. Austin A. Hayden said that not only do few medical men specialize in speech defects but few dentists pay much attention to prosthetic appliances for cleft palate cases. He fancied that the dental surgeons were to blame for the difficulties of the prosthetists, for after they get through with these patients they are either all dead or do not need an obturator or other appliance, but the patient he presented was an example of the need of such an appliance. Dr. Hayden had known Dr. Sayre for a number of years but did not know that he paid particular attention to this line of work. Only after a considerable investigation did it become apparent that he was the best equipped dentist in Chicago to present this very important phase of the subject.

Dr. Hayden thought Dr. Kenyon had criticized tonsillectomy rather severely and stated that the patient he presented had her tonsils removed, on the advice of her family physician because of recurrent sore throat. This was done very carefully, without any mutilation of the pillars. The patient said her speech had been greatly improved since the operation.

Dr. Alfred Lewy believed the use of any kind of filling material raised the question of interference with the soft palate and the isthmus of the pharynx. He believed the function of the isthmus is not only performed by the approach of the soft palate to the posterior wall, but also by the approach of the lateral wall, including the cushions of the eustachian tubes, in a sort of sphincter action. The approach is from all sides at once, and this must be taken into consideration in making any appliances, or in the addition of any foreign material to narrow the opening. Otherwise, the very thing they wished to bring about, the education of the patient in closing the opening by his own musculature, may be defeated.

Dr. J. Holinger asked Dr. Kenyon to explain why there was no regurgitation of fluid through the nose when these patients swallowed. If the palate was really so inadequate, he could not understand why this did not occur. The mother of Dr. Stein's patient admitted regurgitation at once in her child, but none of the patients whom Dr. Kenyon showed knew anything of the possibilities of regurgitation.

Dr. Otto J. Stein stated that in his patient there was not only the palatal shortening, but the tongue had stuck to the roof of the mouth so that there was almost complete immobility of the tongue. He believed the inadequacy of the soft palate was due to lack of development, or fore-shortening, of the hard palate. He had noticed in a few adults who had had their tonsils removed and who had not only an absence of the uvula that there was such a shortening of the palate. It stretched right across the space and there was no defect in the center view. He asked if this was due to the fact that the constrictors supply the necessary muscular action to close off the space in the nasopharynx.

Dr. Kenyon (in closing) said that some years ago in looking up the literature with respect to the congenitally short palate, he found very little information. An English writer, years ago, said that the congenitally short palate was nothing but a manifestation of a congenital defect, and that the edge of the hard palate was indented in these cases. In one of the patients Dr. Kenyon presented this was not true. He has found the same indentations in palates that were perfectly adequate, and believes that some of the palates are developed inadequately, not necessarily in association with cleft.

He did not wish to be understood as criticizing the operation of tonsillectomy, but it must be determined where tonsillectomy is indicated and in which cases it is wrong to use it.

As to the paraffin injections, where there is so much muscular activity he believed that as a matter of course it should not be used. Neither did he believe that any substance placed against the anterior wall of the spinal column could be of benefit. He did not see how such a procedure could be employed without interfering with the anterior constrictor and the other muscles along the spine.

He believed that, in many of the cleft palate and short palate cases, adenoids should not be removed as a routine procedure, because they help the patient to produce a normal, adequate voice. If they are removed this adds to the nasality. It is not right for laryngologists to perform operations indiscriminately, in order to improve the voice. The cases should be analyzed in a finer way to determine whether the tonsils and adenoids should be removed.

As to the regurgitation of fluid, he emphasized his former statement that there are two kinds of adequate palates, and that the type he presented, for the most part, does not have regurgitation of fluid. He is interested in having these children develop a mouth voice and if he could bring about the same mechanism for talking as that employed for swallowing, there would be a vast improvement in the speech.

He believed that if the patient whom Dr. Stein presented proved to be intelligent, the speech could be worked out quite well, but if the child proved to be stupid there would be very serious speech impairment, unless surgical measures could improve the condition. He thought the child should be trained as soon as it began to talk.

With regard to the singing voice, singers tend to employ some degree of nasal resonance, because thereby they get a more beautiful singing voice. They use the palate without completely raising it, and if this relatively incomplete action of the palate were not disturbed by operation, the singing voice would hardly be impaired.